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EFFECT OF ULTRAVIOLET IRRADIATION OF AIR ON INCIDENCE OF INFECTIONS IN AN INFANTS' HOSPITAL

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The application of precautionary measures designed to prevent secondary infections among an organized group, such as the patients in a hospital ward, has resulted in the control, in large measure, of enteric infections and a decrease in the incidence of contagious diseases to such a point that they present little menace. Certain types of infections, notably acute disorders of the respiratory tract, however, have continued to occur in sizable numbers.

The studies which have been made in the Infants' Hospital of Boston have been carried out in an effort to determine to what extent infections continue to occur in a modern, cubicled infants' ward and to ascertain, if possible, what additions to current technic might be necessary for the control of secondary infections, especially those of the respiratory tract.

A survey of the records of the Infants' Hospital for 1935 and 1936 showed that 185, or 12.6 per cent, of the 1,455 patients admitted during the two year period contracted infections in the hospital.[1] This survey was followed in 1937-1938 by a more careful study which included direct daily observation of all patients admitted to the ward, together with a bacteriologic survey of the nasopharyngeal flora of patients on admission, which was repeated if a new infection appeared during hospitalization.[2]

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2. Long, A. P.; McKhann, C. F., and Cheney, L. L.: Hospital Infections: II. Nasopharyngeal Flora and Disease of the Respiratory Tract in Infants, Am. J. Dis. Child. **57**:1363 (June) 1939.

The peak incidence of serious disease of the respiratory tract in infants, judged from admissions to the hospital, occurred in March, while throughout the winter months there was a marked increase in the incidence of both pathogenic and nonpathogenic organisms in the nasopharyngeal flora of the patients.[3]

Nevertheless, examinations for new nasopharyngeal bacterial invaders in secondarily infected patients indicated the source of most of the infections to be the personnel of the hospital and visitors rather than fellow patients, and it was pointed out that overcrowding in connection with infections acquired in a hospital must be considered with reference not only to the other patients but also to the large number of other persons who are permitted to enter the wards. Contamination of the air, demonstrable throughout the wards, was strikingly reduced in the air-conditioned room for premature infants, into which adult traffic was also minimal.

Some diminution in the transmission of organisms was found to follow the masking of all persons entering the ward, but masking, even with a special type of mask, was not sufficient to eliminate secondary infections.

The present study was undertaken to determine the efficacy of ultraviolet radiation, in addition to the precautionary technic already in use, as a further means for the control of secondary infections arising among hospitalized infants.

The bactericidal properties of ultraviolet radiation have been utilized for clinical purposes in air sanitation largely as a result of the work of Wells[4] and of Hart.[5] The sterilization of air in operating rooms to minimize postoperative infections and the use of ultraviolet lamps in hospital wards or nurseries and in schoolrooms to prevent cross infections have been among the suggested practical applications.[6]

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In earlier studies with ultraviolet light barriers in the isolation ward of the Children's Hospital, mercury vapor quartz lamps were used. In the present study, 15 watt, low pressure mercury lamps enveloped in high transmission glass were employed.[7] About 80 per cent of the rays emitted by these germicidal lamps are said to be of 2,537 angstroms, a wavelength which is stated to give maximum bactericidal effect.

The current used was the ordinary lighting circuit, 110 volts, direct current. Each lamp used about 0.33 amperes and put approximately the same load on the house current as does a 30 watt mazda bulb.

Each lamp was provided with an aluminum trough of a high reflection coefficient, which projected the rays in the desired direction and protected patients and personnel from direct irradiation.

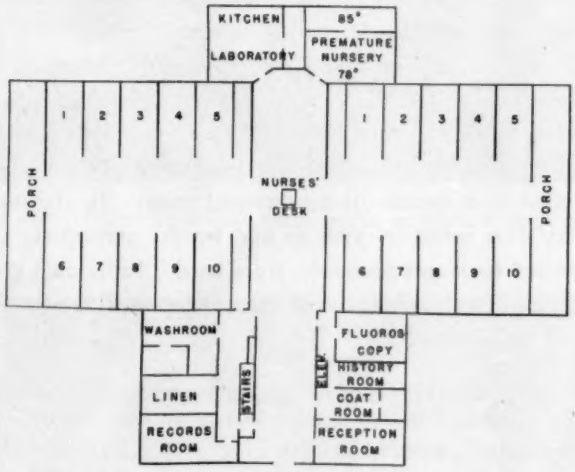

Fig. 1.—Plan of the lower floor of Infants' Hospital.

The present investigation covered the period from Oct. 1, 1939 to June 1, 1940 and included, as did the previous work, bacteriologic examination of material from the nasopharynx of all infants on admission, a similar examination when new infections developed and also a detailed search for the possible sources of the new infections. During the second part of the period, ultraviolet lamps were installed to protect half of the cubicles, while the remainder were kept as a control group. Weekly bacteriologic analyses of the air in the ward were made quantitatively

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and qualitatively, both before and after installation of the lamps. The method of setting up the system used in this study can be best illustrated by reference to figure 1, which depicts the floor plan of the hospital. Each floor contains two units of ten cubicles each. Lamps were installed in front of the ten cubicles in one unit of the ward on the upper floor and before the ten cubicles in the corresponding unit of the ward on the lower floor. Forty lamps were used in each unit, so arranged that two were placed at the entrance of each cubicle (figs. 2 and 3).[8] The lamps were kept lighted for a gradually increasing number of hours daily to make sure that there would be no untoward effects from irradiation on the staff or the patients. No untoward reactions to the irradiation have been observed, in either the patients or the personnel. Erythema and conjunctivitis were particularly watched for. The precaution was taken of placing cotton curtains behind the troughs to prevent direct exposure of infants to the light. After the first week the lamps were operated daily from 8 a. m. to 10 p. m. The same personnel and ward facilities served both an irradiated and a control group of cubicles, while a separate nursing staff cared for the premature infants, housed in a special air-conditioned room. In the units without lamps masks were worn by visitors and by the personnel, while in the wards protected by lamps no masks were used. Individual gown technic and scrubbing of the hands between attendance on different infants were continued in both wards.

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8. The type of installation used here is that described by William F. Wells in *Heating and Ventilating* (**36**:26 [April] 1939) as follows:

"Here the attempt is made to establish an ultra-violet light barrier between the children, thus extending the barrier principle first applied in a corridor of the Isolation Unit of the Infants' and Children's Hospital, Boston.

"Curtains of ultra-violet light are dropped between the cubicles, continuous with a ceiling of bactericidal light emitted from the same source. These walls or curtains are so designed that the eyes of the nurse are not brought into range of the overhead lights, and the time to which the nurse is exposed to ultra-violet light in walking through the wall is so brief as to involve no chance of sunburn. However, the walls are relatively impenetrable to the passage of bacteria borne on ventilating currents and have been demonstrated to be especially effective against the type of infection produced by the evaporation of droplets coughed and sneezed into the atmosphere.

"The basis of design of the ultra-violet light cubicles was worked out by Mr. W. F. Wells in the Laboratories for the Study of Airborne Infection at the University of Pennsylvania. The design itself resulted from the collaboration of these laboratories with Schmidt, Garden and Erickson, architects; Curtis Lighting, Inc., and the General Electric Company.

"Installations of this type are being made in the Children's Hospital, Philadelphia, and the Infants' and Children's Hospital, Boston."

Fig. 2.—Ward with ultraviolet lamps at the entrance of each cubicle.

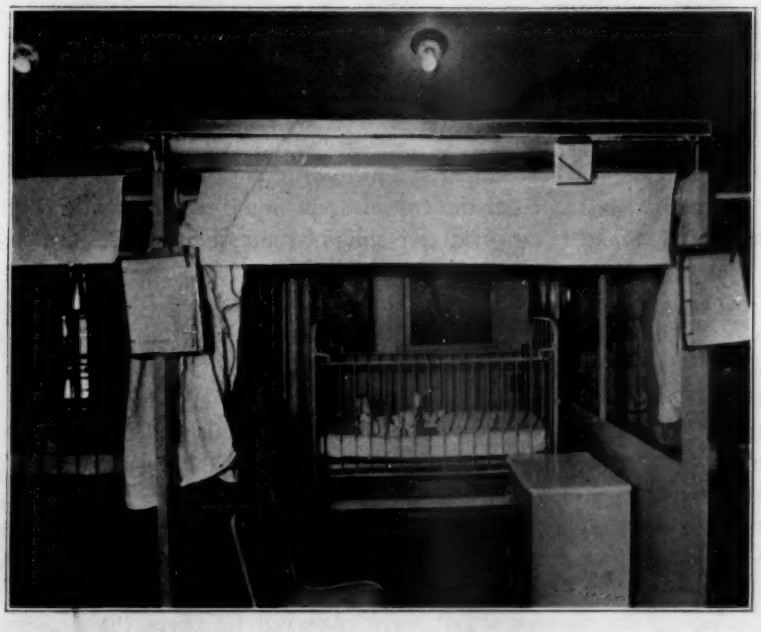

Fig. 3.—One of the cubicles with ultraviolet lamps at entrance.

BACTERIOLOGIC STUDIES OF AIR

The air in each ward was analyzed bacteriologically every week by Wells's method, which has for its principle the centrifugal precipitation of bacteria onto the nutrient medium. Bacteria from 10 cubic foot samples of air were collected on blood agar medium. A slight modification was made in Wells's original procedure in that about 3 cc. of the medium was pipetted into the bottom of the tubes after the centrifugation of the sample of air had been completed. Ordinarily, after a test, this part of the tube contained no medium, so that the organisms there were not detected. Experience has shown that colonies grew in the added medium in numbers that materially affected the total count.

A number of samples of air were examined at various times at different sites in the ward, since activities in the wards varied a great deal and sources of contamination varied correspondingly. Samples

TABLE 1.—*Bacterial Counts of Air Samples from Various Wards*

Ward	Bacterial Count, Colonies per 10 Cubic Feet of Air	Number of Samples *	Number of Samples Positive for Hemolytic Streptococci	Comment
Children's medical	350-500	16	4	Main wards
Medical outpatient department	600-700	10	2	Waiting room
Main operating room	250-300	8	2	No operations at time
Convalescent home (Sharon, Mass.)	25-40	27	0	Open air
Nursery for premature infants	15-20	24	1	Air conditioned
Infants' hospital	30-50	80	0	With lamps
	180-250	150	3	No lamps

* Samples were collected around 11 a. m., during the winter of 1939-1940.

were also obtained for comparison from different places in the Children's Hospital, as well as from the convalescent home for rheumatic children in Sharon, Mass. Comparative results of some of these tests are shown in table 1.

The average counts in the infants' wards ranged from 180 to 250 colonies per 10 cubic feet of air, while counts made in the air-conditioned nursery for premature infants showed the lower figures of 15 to 20 colonies. The counts on air from within the cubicles were usually higher than those on samples from the main aisles. Determinations on air from different levels in the wards gave variable results but showed some tendency to lower counts at heights greater than 5 feet (152 cm.) from the floor. There was not much variation in counts made at different times of the day, but the counts made after 10 p. m. were generally much lower than those made in the daytime.

Among the factors which were observed to affect the number of bacteria in the air were the number of patients in the ward, the amount of activity in the wards and the circulation of the air. In figure 4 are

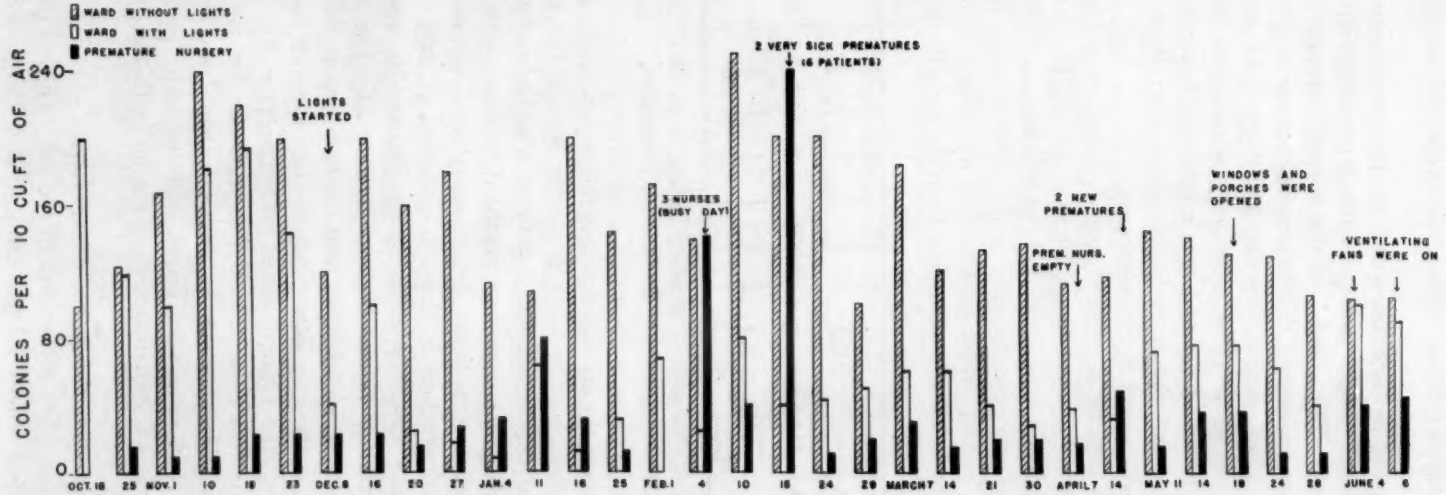

Fig. 4.—Bacterial contents in weekly samples of air from wards in the Infants' Hospital.

shown the comparative bacterial counts on air from the control wards, from the irradiated wards and from the air-conditioned nursery for premature infants. The counts for the nursery for premature infants are particularly noteworthy. With the usual number of patients (about 4 to each small unit), counts were constantly low. An increase in the number of patients or the presence of very sick infants, with increased activity of the personnel, caused the number of bacteria to increase rapidly in these small rooms to levels higher than those revealed by concurrently made counts in the open wards.

The types of organisms most commonly found were Staphylococcus aureus, Staphylococcus albus, fungi, Bacillus subtilis, Bacillus coli, Bacillus alcaligenes faecalis, occasional diphtheroids and micrococci. Hemolytic streptococci were occasionally found, and at such times similar organisms were usually recovered from the nasopharynx of patients or personnel. Pneumococci were recovered from the air only on 2 occasions.

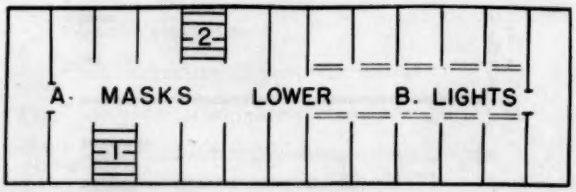

Fig. 5.—Floor plan of cubicles in wards *A* and *B*, to which 2 patients with influenzal meningitis were admitted. See text for explanation.

Contamination of the air with a pathogenic organism, from an infected patient or by dissemination from a carrier among the personnel, is illustrated by our experience with 2 patients who had influenzal meningitis (fig. 5). Both patients were admitted to ward A, which had no ultraviolet lamps, several hours before samples of air were collected. Patient 1 was admitted at 5:30 p. m., January 15, and died on January 17. Patient 2 was admitted at 1 p. m. January 16, was transferred to ward B on January 17 and died on January 20. The organisms in the material from the nasopharynx and the ears and in the spinal fluid of both patients, as well as those from the air, were all found to be of the same virulent type (Haemophilus influenzae type B). Air samples from ward A continued to contain the organism for two days after both patients had been removed. Although patient 2 was transferred to ward B, which had ultraviolet lamps, and the same personnel cared for the two wards, no contamination of the air with the organism was detected in ward B.

After installation of the lamps, changes were observed both in the number and in the types of bacteria in the air. During the first week the counts dropped almost 90 per cent, so that the figures resembled

those for counts in the nursery for premature infants (fig. 4). Subsequent counts were not so consistently low, but the figures did stay well below half of the original counts.

Samples from the level of the lamps and from the areas of direct radiation gave only slightly lower counts than did those from more remote places. That this difference was not greater may probably be attributed to the presence of the aluminum reflectors, which dispersed the rays, and to the rate of circulation of the air about the lamps. No unusual or pathogenic organisms were recovered in the wards which had ultraviolet lamps during the period of study.

After the installation of the ultraviolet lamps, the counts in the wards without the lamps also diminished slightly, probably because of the free circulation of sterilized, irradiated air between the two sides.

TABLE 2.—*Common Pathogenic Organisms Found in Cultures of Material from Nasopharynx of 469 Patients*

Organism	Carrier Patients *	"Sick" Patients
H. influenzae	25	12
Streptococcus haemolyticus	26	56
Pneumococcus	29	88
Hemolytic Staphylococcus aureus	5	14

* Carrier patients were those in whom the organism seemed unrelated to a disease process, and "sick" patients, those in whom the organism seemed the causative agent of an infectious process.

The amount of growth in the culture tubes was so distinctive that one could readily determine whether the samples had been obtained from an irradiated or an unirradiated unit.

When warm days set in and windows and doors were opened, slightly lower bacterial counts were obtained from the control wards and slightly higher counts from the irradiated wards, but when large, air-cooling ventilating fans were turned on, creating a rapid turnover of air in the wards, the counts became the same on the two sides (the wards with and those without radiation).

EPIDEMIOLOGIC STUDIES

Material for culture was obtained on admission from the pharynx and from each nasal cavity of all 469 patients included in the study. Over 1,500 cultures were made, including those made when a second examination was indicated. The results revealed that a fairly large proportion of the patients were carriers, who constituted potential sources of air contamination and possibly of infection. Table 2 gives the number of patients who were carriers as compared with the number of those in whom the bacteria detected could definitely be considered the causative

agent of or were at least the major factor in an infectious process. It will be noted that pneumococci and hemolytic streptococci were the most common pathogenic types of organisms encountered.

The epidemiologic investigations proved to be one of the most difficult phases of the study. Approximately 40 to 50 persons came into the wards daily, and the number was even greater on visiting days. Obviously, it was not practical to obtain material for culture from all these persons routinely or every time infections arose. Also, patients had to be transported from one place to another for roentgen or fluoroscopic examinations, for presentation to classes or for administration of treatments. This rendered the tracing of sources of infection most difficult.

New infections arising in the hospital ward may be presumed to result from one of the following modes of transmission: (1) patient to patient contact; (2) articles and clothing passed from patient to patient; (3) personnel to patient transmission, or (4) aerial transmission.

The first and second factors were largely eliminated in these studies, since the patients were infants who were kept constantly in their beds in individual cubicles, with the articles needed for daily care kept in each cubicle. Personnel to patient transmission was minimized as far as possible by the use of aseptic technics, the wearing of individual gowns, the scrubbing of hands and the use of masks.

No masks were worn in the irradiated wards; this was not because it was believed that bactericidal radiation could prevent transmission of infections directly from personnel to patient. The aim was rather to observe to what extent the use of masks as compared with irradiation of the air affected the number of cross infections and whether it might be essential to combine the use of masks and irradiation. Masks were worn in the irradiated units, however, by nurses and by physicians who had infections of the respiratory tract and by persons transporting infants outside the irradiated areas.

Even in so small a unit as the nursery for premature infants, to which only a limited number of persons had access and from which patients were not removed for roentgen examinations or for treatments, it was not easy to locate the source of an infection. For example, when a streptococcic infection developed in 1 of the infants, culture of the air was positive for hemolytic streptococci on the same day that the cultures of material from the patient were reported positive for that organism. Cultures of material from the nose and throat were made for the other patients and for 2 physicians and 12 nurses, with positive results for 1 nurse and 1 physician. In this nursery the personnel were all masked, and persons with evidences of any infection of the respiratory tract were rigidly excluded.

In this instance as well as in a number of others aerial transmission of organisms presented a possible explanation of the development of secondary infection. However, except for the absence of such transmission in the irradiated units, there was no conclusive evidence ruling out the possibility that the personnel served as intermediaries in the spread of the various organisms. In an unirradiated ward, suppurative otitis media developed in 2 patients for whom cultures on admission had revealed nothing of importance, and in both instances hemolytic streptococci were recovered. One other patient in that ward harbored the same organism. In the same ward otitis media developed in a cretin, and on culture pneumococcus type XIV was discovered, while the culture made on admission had been negative for this organism. In a neighboring cubicle was a patient with pneumonia caused by type XIV pneumococcus.

Again, in an unirradiated ward pneumonia developed in a patient from whom pneumococci type XVIII were recovered. Two days previously a patient who had had pneumonia due to the same type of organism had been discharged from the next cubicle.

Also in an unirradiated ward pneumonia due to the type XXXIII pneumococcus developed in a patient with eczema. Another patient with pneumonia due to this organism occupied a cubicle in the opposite corner of that ward.

None of the personnel contracted any serious or unusual infections during the period of the study, nor could it be stated that the 8 mild infections of the upper respiratory tract which did occur were acquired in the wards. The health of the nurses in the ward under study seemed better than that of nurses in other parts of the hospital.

Although some other patient often could be pointed out as a possible source of the infecting organisms, the role of the personnel in transmission of the infection could not be eliminated. The best evidence indicating that many of the secondary infections were air borne is found by comparing the incidence of such infections in the control units with that in the units irradiated with ultraviolet light.

The study included observation and careful follow-up of 469 infants. Only patients who stayed in the ward over twenty-four hours were included. Up to December 15, the same routine technics and procedures were followed as in the preceding investigations, but neither masks nor ultraviolet lamps were employed. The incidence of infections among the 95 patients observed was 10.5 per cent, a figure conforming closely to that found in the earlier studies.

After the installation of the lamps on December 15, 374 patients were observed. Of this group, 224 patients (including 48 premature infants) were in wards without lamps and 150 were in the irradiated wards.

In the control group of 224 patients in wards without lamps the incidence of infections was 12.5 per cent, of which over 50 per cent were disorders of the respiratory tract. Of the 28 new infections that developed in this group, 9 occurred among premature infants. Most of the hospital infections occurred in February, March and April, the months in which admissions of patients with diseases of the respiratory tract were also highest.

As in the previous studies, no contagious diseases developed in the wards, probably because of the meticulous precautions taken at the time of admission to exclude exposed patients as well as those in whom contagious disease was already present.

Only 4 new infections developed in the group of 150 patients who were admitted to the irradiated wards, an attack rate of 2.7 per cent, which is in sharp contrast to that of 12.5 per cent in the unirradiated

TABLE 3.—*Incidence of Infections in Irradiated and Unirradiated Wards*

Month	Unit With Ultraviolet Lamps		Unit Without Ultraviolet Lamps			
			Number of Patients Admitted		Number of Infections	
	Number of Patients Admitted	Number of Infections	Premature Infants	Total	In Premature Infants	Total
December	10	0	5	15	0	1
January	36	0	9	38	1	4
February	22	0	12	41	2	6
March	26	2	6	38	3	6
April	28	0	11	48	2	7
May	28	2	11	44	1	4
Total	150	4	54	224	9	28

wards. Of these 4, 1 was an infection of the skin and the other 3 were disorders of the respiratory tract. It is noteworthy that 2 of the 3 infections of the respiratory tract occurred during the latter part of May, when windows and porches of the wards were opened and when the bacterial counts of the air in the irradiated wards were the same as in the unirradiated units, apparently because the rapid circulation and strong currents of air vitiated the effects of the ultraviolet lamps.

Although the number of cases is small, the difference in the incidence of infection between the irradiated and the unirradiated units of the wards was so marked as to appear significant (table 3). The lamps seemed definitely to have reduced the number of infections acquired by patients in the hospital during the period of study, while the masking of personnel apparently had little influence on the incidence or severity of secondary infections.

Although the initial cost for installation of the lamps might seem high, the current consumed was calculated to cost only about 70 cents daily

for both units. The germicidal lamps gradually lose their potency, having ordinarily a life span of about 1,500 hours; thus if they are used with any constancy throughout the winter months, new tubes are required at least once a year. The fact that our lamps were burned almost 2,500 hours in the present trial possibly explains the higher bacterial counts in the irradiated areas in later months and partially explains the 2 infections which occurred in May in the irradiated wards.

SUMMARY

With all commonly practiced precautions, hospital infections, particularly of the respiratory tract, have continued to occur in sizable numbers in an infants' hospital.

Contamination of the air with organisms pathogenic for the respiratory tract could be demonstrated in the wards of the hospital, and at certain times and with certain diseases aerial transmission of organisms seemed to be the mode of spread of disease.

A limited experience with ultraviolet irradiation gave results that seemed to be significant and well beyond the limits of error in that while in a control ward the hospital infection rate during the winter of 1939-1940 was 12.5 per cent, in a ward in which the conditions were entirely comparable except that each cubicle was protected across the front and across the top by ultraviolet radiation the cross infection rate was 2.7 per cent.

Mr. W. F. Wells gave advice and suggestions in this study; Dr. Stuart Mudd made a grant in aid of the project, and the General Electric Co. and Curtis Lighting, Inc., gave part of the apparatus employed.

COCARBOXYLASE, PYRUVIC ACID AND BISULFITE-BINDING SUBSTANCES IN CHILDREN

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It has been known for years that the adequate functioning of the brain is dependent on a carbohydrate substrate and an adequate supply of oxygen. In addition, various enzyme and coenzyme systems are necessary for the complete breakdown and utilization of this carbohydrate by the brain. Among the more important of the latter systems is thiamine (vitamin B_1), or, more specifically, its diphosphoric ester, cocarboxylase. Proof is now available that this substance is necessary for the breakdown of pyruvic acid,[1] one of the normal intermediary products of carbohydrate catabolism. This is further substantiated by the fact that in oriental Beriberi [2] and alcoholic peripheral neuropathy,[3] both diseases known to be due to a deficiency of vitamin B_1, pyruvic acid accumulates in the body fluids. Further work may of course indicate that conditions other than those resulting from a deficiency of vitamin B_1 may cause elevations of the levels of pyruvate in the blood and the spinal fluid, even under basal conditions.

Methods of measuring this active form of thiamine (cocarboxylase) or the carbohydrate catabolite (pyruvic acid) which accumulates in its absence might therefore prove of practical value to physicians interested in the nutritional problems of children.

MATERIALS AND METHODS

The determinations were done on patients in the wards of the psychiatric division of Bellevue Hospital. Conduct disorders, behavior problems, psychoneuroses and mental deficiency comprised the various causes for hospitalization

This work was aided by a grant from the Child Neurology Research (Friedsam Foundation).

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of these children. None of the children showed any of the generally recognized clinical signs of vitamin B_1 deficiency, nor were any suffering from any febrile or wasting disease which might be expected to produce such a deficiency.

In general, these subjects were from a low economic stratum of society. If, as has been frequently postulated, subclinical and low grade clinical deficiencies of vitamin B_1 are common in this country, one might expect to find these conditions frequently in such a group of children selected from the population of a metropolitan area like New York city. This possibility must be kept in mind when interpreting the results of our determinations.

All estimations were done in the morning, before breakfast, and with the patient resting in bed. Estimations of the levels of pyruvic acid were done by the method of Bueding and Wortis.[4] The levels of cocarboxylase in the blood were estimated by Goodhart's modification[5] of the method devised by Goodhart and Sinclair.[6] The amount of bisulfite—binding substances was determined by our modification[7] of the method of Clift and Cook, which we have described elsewhere.[8]

LEVELS OF COCARBOXYLASE

We estimated the values for cocarboxylase in the blood of 50 children varying in age from 4 to 15 years. The values obtained ranged from 4 micrograms per hundred cubic centimeters (2 subjects) to 13 micrograms (1 subject), with an average of 7.5 micrograms (± 1.82). Determinations on the spinal fluid are not reported, because Goodhart[6] has previously shown that cocarboxylase is not present in the normal spinal fluid.

The only values we have with which to compare these figures are those obtained by Goodhart and Sinclair in England for 26 adult subjects chosen from a much higher economic and social stratum of society. Their group comprised 17 research workers, 4 resident hospital physicans and 5 medical students. Their values for cocarboxylase in the blood ranged from 4.5 micrograms per hundred cubic centimeters (4 subjects) to 12.0 micrograms (1 subject), with an average of 7.0 micrograms (± 2.1).

There is therefore no significant difference between the average values for these two groups.

Twenty-four of the 50 children were 12 years of age or over. For them the average value for cocarboxylase in the blood was 6.5 micrograms (± 1.38) per hundred cubic centimeters. The average value for the 26 children under 12 years of age was 8.0 (± 2.06) micrograms per hundred cubic centimeters. The latter group included the 2 children

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whose value was 4.0 micrograms per hundred cubic centimeters of blood. Here again the differences are not statistically significant, but we believe that a trend to higher values in the younger children is indicated. If this is true, the comparison of our values with those obtained by Goodhart and Sinclair for adults is not fair, and the possibility exists that many of these children actually are suboptimally supplied with vitamin B_1. The effect of diets high in vitamin B_1 on the values for cocarboxylase in the blood and on the general health and the weight of such children is now under investigation.

LEVELS OF PYRUVIC ACID

Estimations of the amount of pyruvate in the blood were made for 35 children, and for 10 of these the level of pyruvate in the spinal fluid was also estimated. In table 1 the results are compared with similar

TABLE 1.—*Levels of Pyruvic Acid in Blood and Cerebrospinal Fluid*

	Level of Pyruvic Acid, Mg. per 100 Cc.							
	In Blood			In Cerebrospinal Fluid			In Cerebrospinal Fluid / In Blood	
	No. of Subjects	Range of Values	Average Value	No. of Subjects	Range of Values	Average Value	Range of Ratios, %	Average Ratio, %
Children, aged 7 to 16 years	35	0.71-1.21	0.96	10	0.70-1.02	0.86	72-105	92
Adults, aged 17 to 70 years	60	0.77-1.16	0.98	45	0.42-1.21	0.815	43-118	82

ones obtained from examination of the blood of 60 normal adults, for 45 of whom simultaneous determinations of the amount of pyruvate in the spinal fluid were done. It will be noted that the ranges of levels in both the blood and the cerebrospinal fluid for children and adults were almost identical.

Two adult subjects for whom a diagnosis of hebephrenic schizophrenia was subsequently made had a value of 0.42 mg. of pyruvate per hundred cubic centimeters of spinal fluid. These are likely isolated values, since we have subsequently seen many patients with hebephrenia with normal values for pyruvate in the spinal fluid.[3] The ratio of the level of pyruvate in the spinal fluid to that in the blood was within the range of 70 to 120 per cent except in these 2 instances.

The values given for pyruvic acid in the blood of these children do not, either in the average or in the extremes of the range, indicate any disturbance in the metabolism of this substance. However, as thiamine is not definitely known to be the only factor responsible for normal levels

of pyruvic acid in the blood and as the degree of suboptimal supply of this vitamin necessary to produce detectable elevations of pyruvate in the blood is also unknown, one cannot infer from such evidence alone that subclinical vitamin B_1 deficiency did not exist in these subjects.

LEVELS OF BISULFITE-BINDING SUBSTANCES

Pyruvic acid, in common with other keto acids and, in fact, all aldehydes and ketones, possesses the ability to bind bisulfite. These bisulfite-binding substances (total aldehydes and ketones) have been the subject of much recent investigation, and their relation to vitamin B_1 deficiency has been both confirmed [9] and denied.[10] Our recently completed studies show clearly that the amount of bisulfite-binding substances in the blood and the cerebrospinal fluid cannot be used as an indication

TABLE 2.—*Levels of Bisulfite-Binding Substances in Blood and Cerebrospinal Fluid*

	Level of Bisulfite-Binding Substances, Mg. per 100 Cc.							
	In Blood			In Cerebrospinal Fluid			In Cerebrospinal Fluid / In Blood	
	No. of Subjects	Range of Values	Average Value	No. of Subjects	Range of Values	Average Value	Range of Ratios, %	Average Ratio, %
Children, aged 3 to 16 years	93	2.0-4.9	3.55	30	0.42-1.79	1.24	21-51	36
Adults, aged 17 to 70 years	105	2.0-5.72	3.84	52	0.42-3.07	1.63	21-64	42

of vitamin B_1 deficiency and, as a matter of fact, cannot be used as an accurate measure of the levels of pyruvic acid in those fluids.[7] The value for these substances does, however, serve as an accurate measure of the total aldehydes and ketones in the body fluids, and since the literature is still replete with articles utilizing this index as a measure of vitamin B_1 deficiency, we include our figures.

Our figures for normal children without evidence of physical or mental illness are compared with those for a similar group of adults in table 2.

It will be noted that the values for bisulfite-binding substances in both blood and spinal fluid are somewhat lower for the children than

9. Sherman, W. C., and Elvehjem, C. H.: Am. J. Physiol. **117**:142, 1936; J. Nutrition **12**:321, 1936. Thompson, R. H. S., and Johnson, R. E.: Biochem. J. **29**:694, 1935. Johnson, R. E.: ibid. **30**:31, 1936. Wilson, H. E. C., and Ghosh, B. C.: Indian M. Gaz. **72**:47, 1937. Platt and Lu.[2a]

10. Wilkins, R. W.; Taylor, F. H. L., and Weiss, S.: Proc. Soc. Exper. Biol. & Med. **35**:584, 1937. de Jong, S.: Arch. néerl. de physiol. **21**:465, 1936.

for the adults. The range of levels in the blood, however, is well within the normal range previously set by Wilkins and his co-workers, and it may be that this slight difference is more apparent than real. Since our own figures for bisulfite-binding substances in the spinal fluid are the only ones available at present, we can draw no conclusions concerning the lower figures obtained for children or the factors which may contribute to a higher average level in adults.

SUMMARY AND CONCLUSIONS

The relations of cocarboxylase (the diphosphoric ester of thiamine) and pyruvic acid to vitamin B_1 metabolism are briefly discussed and their importance in the metabolism of children mentioned.

Normal values for pyruvic acid, bisulfite-binding substances and cocarboxylase in the blood and the spinal fluid are reported for both children and adults and methods for their determination mentioned.

COCARBOXYLASE CONTENT OF BLOOD OF INFANTS AND OF CHILDREN

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AND
ELIZABETH M. KNOTT, PH.D.
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For several years we have been studying the vitamin B_1 (thiamine) requirements of infants and children. In order to determine the factors which affect the amount of thiamine required, we have analyzed its excretion in urine and feces under various conditions and have also studied the effects of administering supplements of thiamine hydrochloride.

We now wish to report a new phase of our work. For the first time we have been able to measure the amount of thiamine circulating in the body. In this investigation we have determined the amounts of cocarboxylase in the blood of infants and children who exhibited pathologic conditions of varying severity. We have been specifically interested in cocarboxylase, since it is the active, phosphorylated form of thiamine.

Goodhart and Sinclair [1] have recently published two papers on the amount of cocarboxylase in the blood of adult subjects. They found that the range for 26 normal men aged 20 to 40 years was from 4.5 micrograms to 12.0 micrograms of cocarboxylase per hundred cubic centimeters of blood, with a mean value of 7.0 micrograms.

METHOD

We have used the method of Goodhart and Sinclair, with a few modifications. The technic is based on the ability of thiamine to stimulate markedly the decarboxylation of pyruvic acid by alkaline-washed yeast in the presence of cocarboxylase. When the solution is properly buffered and there is an adequate amount of carboxylase, from the washed yeast, and of added thiamine available, the amount of carbon dioxide liberated from the pyruvic acid is directly proportional to the

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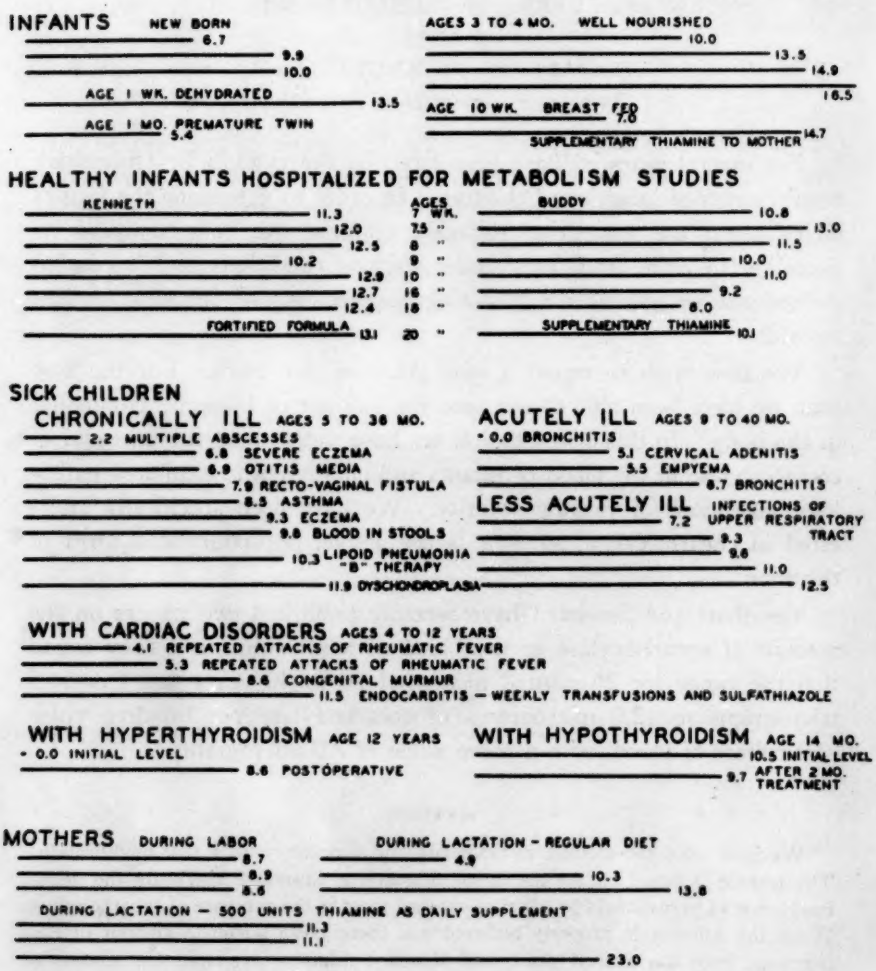
From the Department of Pediatrics, University of Chicago.

Read before the Section on Pediatrics at the Ninety-First Annual Session of the American Medical Association, New York, June 12, 1940.

1. Goodhart, R. S., and Sinclair, H. M.: (*a*) Estimation of Cocarboxylase (Vitamin B_1, Diphosphate Ester) in Blood, Biochem. J. **33**:1099-1108 (July) 1939; (*b*) Deficiency of Vitamin B_1 in Man as Determined by Blood Cocarboxylase, J. Biol. Chem. **132**:11-21 (Jan.) 1940.

quantity of cocarboxylase in the reacting mixture. The carbon dioxide evolved is measured by means of a Warburg manometer. Two cubic centimeters of blood is sufficient to permit duplicate determinations by this technic.

In the chart, which summarizes our results, we have grouped our data according to the age of the patient and on the basis of the severity



Levels of cocarboxylase (diphosphate thiamine ester) in the blood of infants, children and mothers. Values are expressed as micrograms of cocarboxylase per hundred cubic centimeters of blood.

of the pathologic condition. For 3 newborn infants we obtained values of 6.7, 9.9 and 10.0 micrograms of cocarboxylase per hundred cubic centimeters of cord blood. For an infant a week old, somewhat dehydrated and in a rather critical condition because of spina bifida, the

figure in the blood for cocarboxylase was slightly higher, 13.5 micrograms per hundred cubic centimeters. In contrast, a premature twin 1 month of age had only 5.4 micrograms of cocarboxylase per hundred cubic centimeters of blood.

Three other infants, about 4 months of age, who appeared to be well nourished, although they had been hospitalized for erythroblastosis, hydrocephalus and congenital mesenteric cyst, had high values of cocarboxylase, 10.0, 13.5 and 16.5 micrograms respectively per hundred cubic centimeters of blood. Another infant in this age group had a feeding problem which was adjusted by giving him a Dryco formula (partially defatted dried milk) fortified with vitamin B. His blood contained 14.9 micrograms of cocarboxylase per hundred cubic centimeters. In contrast to these high values, that of an apparently healthy 10 week old infant who was being breast fed at the time of the test was only 7.0 micrograms of cocarboxylase per hundred cubic centimeters. The amount of cocarboxylase in this infant's blood, however, increased to 14.7 micrograms when 500 international units of thiamine hydrochloride was given as a daily supplement to the mother.

An interesting part of our investigation has been the continuous observation of 2 healthy infants who were hospitalized for metabolism studies. These infants were of the same age and received the same type of food, although 1 (Kenneth), being larger, was fed greater quantities of both the breast milk and the evaporated milk formulas. It will be noticed from the chart that in Kenneth's blood a level of about 12 micrograms of cocarboxylase per hundred cubic centimeters was consistently maintained, whereas there were gradually decreasing amounts in the blood of the other infant (Buddy). When the level of cocarboxylase in Buddy's blood had dropped to 9.2 micrograms per hundred cubic centimeters, symptoms of slight vitamin B_1 deficiency were evident. At times he showed signs of anorexia; his blood contained about 15 per cent more pyruvic acid than the amount found for Kenneth, and there was a possible slight deviation in his electrocardiogram. He did not grow as rapidly as Kenneth, although receiving more calories per kilogram of body weight, and all his symptoms were slightly more noticeable when the cocarboxylase in his blood had decreased to a level of 8.0 micrograms per hundred cubic centimeters. As Buddy had had thrush when less than a week old, we assumed that he had a poorer start in life than Kenneth had and probably required greater amounts of thiamine. It may be, however, that he did not absorb the vitamin as readily from his digestive tract as did Kenneth, for he constantly passed stools of a looser type than Kenneth's. When 133 international units of thiamine hydrochloride was added daily to his regular formula, the level of cocarboxylase in his blood increased to 10.1 micrograms per hundred cubic

centimeters. The amount of cocarboxylase in Kenneth's blood likewise increased, but to a lesser extent, when he was given a formula fortified with vitamin B_1.

For the group of chronically ill young children, the lowest values, 2.2, 6.8 and 6.9 micrograms of cocarboxylase per hundred cubic centimeters of blood, were obtained for patients with multiple abscesses, severe eczema and prolonged otitis media. A girl with a rectovaginal fistula, a small girl with bronchial asthma and a child with less severe eczema had intermediate values, of 7.9, 8.5 and 9.3 micrograms of cocarboxylase, respectively, per hundred cubic centimeters of blood. A chronically ill 8 month old infant with lipoid pneumonia was undernourished, but administration of daily supplements of vitamin B_1 enabled him to maintain a level of 10.3 micrograms of cocarboxylase per hundred cubic centimeters of blood. The highest level, 11.9 micrograms per hundred cubic centimeters of blood for any of these chronically ill small children was obtained for a 3 year old boy with dyschondroplasia, which apparently had no effect on the state of his nutrition unless decreased activity permitted higher storage because of lower needs for the vitamin.

For more acutely ill children, the home situation seemed to be a factor in determining the level of cocarboxylase in the blood. In the blood of one 9 month old infant with bronchitis there was no measurable amount of cocarboxylase, whereas in another infant of the same age and with an illness of about the same severity there was 8.7 micrograms of cocarboxylase per hundred cubic centimeters of blood. The first infant had had less opportunity to receive an adequate diet in early infancy. Two children with rather severe cervical adenitis and empyema also had low values, of 5.1 and 5.5 micrograms of cocarboxylase per hundred cubic centimeters of blood. The less acutely ill children with infections of the upper respiratory tract had higher levels, of 7.2, 9.3, 9.6, 11.0 and 12.5 micrograms of cocarboxylase per hundred cubic centimeters of blood.

From study of these children with chronic and with acute illnesses, although the number is small, we believe one can conclude that if the illness is prolonged over a sufficient period or if the child is severely ill, there is a distinct tendency for the values for cocarboxylase in the blood to be low. If, however, the illness is less severe or of shorter duration or if supplementary vitamin B_1 is given, the level of cocarboxylase may be maintained equal to that of normal healthy children. The adequacy of early diets seems to be important if the child is to have a sufficient vitamin reserve to carry him safely through periods of ill health.

The values reported for the 4 children with cardiac ailments are in accord with these conclusions. Two 9 year old children who had had repeated attacks of rheumatic fever had levels of only 4.1 and 5.3 micro-

grams of cocarboxylase per hundred cubic centimeters of blood. A 4 year old boy whose disease at first was thought to be rheumatic fever but was later diagnosed as congenital cardiac murmur had 8.6 micrograms of cocarboxylase per hundred cubic centimeters of blood. An older boy with severe endocarditis had the surprisingly normal value of 11.5 micrograms. While this high value for a boy with a prolonged acute disorder is probably due to the weekly blood transfusions he received, the results may possibly be in error because of the sodium sulfathiazole given him.

A 12 year old girl with classic hyperthyroidism proved to be an extremely interesting subject. When she was first hospitalized, her blood contained no measureable amount of cocarboxylase. Single large doses of thiamine hydrochloride raised the level of cocarboxylase in the blood only temporarily, but after she had undergone an operation, without supplementary vitamin B_1 the cocarboxylase content rose to 8.6 micrograms per hundred cubic centimeters and the child's nervousness disappeared. Presumably, her high basal metabolic rate during the period of observation before operation so increased her needs for vitamin B_1 that she was unable to maintain a level of cocarboxylase in her blood although she received a well balanced diet. When her basal metabolic rate had returned to normal, the cocarboxylase content of the blood increased. For a child with hypothyroidism the two rather normal values of 10.5 and 9.7 micrograms of cocarboxylase per hundred cubic centimeters of blood were determined.

In addition to the studies on infants and children, we have made determinations on the blood of a few mothers during labor and lactation. Two of the women in labor had a level of cocarboxylase slightly less than that of their respective infants, while the third had more vitamin per hundred cubic centimeters of blood than did her infant. All 3 women had values just under the average level determined for our healthy children. Of the women who were lactating, 1 had a subnormal value, of 4.9 micrograms, while the levels of the other 2 were well within the normal range. When they were given supplements of thiamine hydrochloride, the level of cocarboxylase in the blood of these women increased by 8 per cent, 67 per cent and 130 per cent. Samples of their milk obtained both before and after the administration of thiamine hydrochloride are at present being analyzed for their thiamine content by means of biologic assays.

In conclusion, on the basis of the data for our healthier subjects, we wish to emphasize that an infant or young child should have a value for cocarboxylase in the blood of 10.0 micrograms, or more, per hundred cubic centimeters. Our data clearly indicate that for many children with prolonged chronic or acute illnesses the values for vitamin B_1 are much lower than this figure. Since thiamine is needed by all the cells

of the body to insure the adequate oxidation of carbohydrates and is specifically valuable for the proper functioning of nerve tissue, we believe that vitamin B_1 therapy is important as a safeguard to the child.

The data presented here must be regarded only in the light of a preliminary report.

What seems to be of greatest importance is the probability that a method is now available by which the thiamine content of vital fluids, especially the blood, can be accurately measured and which will aid in the detection of subclinical B_1 deficiency, about which there is so much loose talk and to which such a wide range of symptoms is charged.

In continuing this work we shall study the possibility of maintaining satisfactory levels of cocarboxylase in the blood by means of carefully selected diets, and we shall also investigate more completely the effects of administration of supplementary thiamine hydrochloride to patients with prolonged or acute illnesses.

INFECTIOUS MONONUCLEOSIS WITHOUT CLINICAL SIGNS OR SYMPTOMS

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The occurrence of numerous epidemics of infectious mononucleosis, in foundling homes, children's hospitals, schools and colleges, has been reported.[1] The persons involved in these outbreaks all had symptoms or physical manifestations of some kind. The number of cases in these epidemics rapidly reached a peak and then declined. The blood of most of the patients showed a marked increase in the mononuclear elements. In some instances the abnormal type of lymphocyte considered characteristic of infectious mononucleosis was present; in others an increase in the number of small lymphocytes occurred without the presence of abnormal cells. The results of the Paul-Bunnell test, which was used in only three of the epidemics reported on in the literature, were given as positive in two reports (Nolan [1g] and York and Eckley [1k]) and negative in the third (Rosenbaum [1f]).

In view of the fact that the patients in these epidemics of infectious mononucleosis had clinical symptoms or demonstrable physical manifestations, it was thought of interest to describe an outbreak of an atypical form of the disease in which clinical symptoms and signs were entirely lacking. The epidemic spread slowly through a group of 108 children who had had rheumatic fever and were receiving convalescent care in

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From Irvington House.

This work was aided by a grant from the Commonwealth Fund.

1. (*a*) Scheer, K.: Eine Epidemie des Pfeifferschen Drüsenfiebers, Monatschr, f. Kinderh. **48**:59, 1930. (*b*) Davis, C. M.: Acute Glandular Fever of Pfeiffer, J. A. M. A. **92**:1417 (April 27) 1929. (*c*) Burns, J. E.: Glandular Fever: Report of an Epidemic in the Children's Ward of the Union Protestant Infirmary, Arch. Int. Med. **4**:118 (Aug.) 1909. (*d*) Tidy, H. L., and Daniel, E. C.: Glandular Fever and Infectious Mononucleosis, with an Account of an Epidemic, Lancet **2**:9, 1923. (*e*) Guthrie, C. C., and Pessel, J. F.: An Epidemic of "Glandular Fever" in a Preparatory School for Boys, Am. J. Dis. Child. **29**:492 (April) 1925. (*f*) Rosenbaum, S.: Febris lymphocytocica, Ann. pædiat. **152**:116, 1938. (*g*) Nolan, R. A.: Report of So-Called Epidemic of Glandular Fever (Infectious Mononucleosis), U. S. Nav. M. Bull. **33**:479, 1935. (*h*) Baldridge, C. W.; Rohner, F. J., and Hausmann, G. H.: Glandular Fever (Infectious Mononucleosis), Arch. Int. Med. **38**:413 (Oct.) 1926. (*i*) Mills, J.: Glandular Fever, Roy. Berkshire Hosp. Rep., 1932, p. 66. (*k*) York, W. H., and Eckley, P. W.: Acute Infectious Mononucleosis, Journal-Lancet **57**:15, 1937.

Irvington House. The disease was discovered by accident because leukocyte counts were done at regular intervals as part of the general medical routine.

MATERIAL

Institution Population.—One hundred and eight children who had had one or two attacks of rheumatic polyarthritis or carditis, without severe cardiac enlargement, were admitted to Irvington House during the summer and fall of 1939 and then remained in the institution from December 1 until the end of May 1940. There were 66 girls and 42 boys, varying in age from 6 to 14 years. One hundred and five of the 108 children were white and there were 3 Negroes, all girls. The children lived and went to school in the same building. They had no contact with other children, and each child was permitted only 2 adult visitors every six weeks.

Temperatures and pulse rates were taken three times daily. Leukocyte counts and determinations of hemoglobin levels and sedimentation rates were done routinely every three or four weeks, more often when infections of the upper respiratory tract were prevalent or symptoms of any kind developed.

First Case of the Infection.—The infection was introduced by a white girl (patient 1) aged 6½ years, admitted on Oct. 10, 1939, who had leukocytosis (29,100 cells per cubic millimeter, with 82 per cent lymphocytes). The results of the physical examination at entry were negative: the temperature was normal, and no glandular or splenic enlargement, pharyngitis or rash was present. The child had undergone tonsillectomy on Sept. 25, 1939, and it was thought that the blood picture might reflect a peculiar postoperative reaction. The leukocyte count remained at the same level for one month and then decreased gradually, becoming normal by the end of November.

Subsequent Cases.—On November 27, a routine blood count revealed a similar condition in a girl aged 12½ years, whose bed was at the other end of the same dormitory in which the first patient slept. Her blood showed 26,800 white cells per cubic millimeter, with 84 per cent lymphocytes (patient 2). Physical examination gave negative results. There was no glandular or splenic enlargement, fever, pharyngitis or rash. No enlargement of the mediastinal lymph nodes could be demonstrated by roentgenogram. Her leukocyte count remained elevated for two weeks, then decreased gradually and was normal after one month.

During the next six months, the disease developed in 14 more patients. In them, as in patient 2, the disease was discovered by routine leukocyte counts. None of these children had symptoms or fever. The results of physical examinations were entirely negative. Urinary examinations showed no abnormal conditions. There was no change in the erythrocyte counts or hemoglobin levels and no rise

in the sedimentation rates. The results of the Paul-Bunnell test were negative for all 16 patients.

The data in regard to date of onset and probable duration of the disease, maximum leukocyte count, with the percentage of lymphocytes, and the dates and results of the Paul-Bunnell test are presented in table 1.

TABLE 1.—*Data on Sixteen Patients with Infectious Mononucleosis*

Patient No.	Age, Years	Sex	Race	Approximate Date of Onset	Probable Duration, Weeks	Maximum Number of Leukocytes per Cu. Mm.	Percentage of Lymphocytes	Paul-Bunnell Test	
								Date	Result
1	6½	F	W	10/11/39	6	33,300	78	10/11/39 11/22/39	Negative
2	12½	F	W	11/27/39	4	37,900	78	11/29/39	Negative
3	11½	F	W	12/13/39	2	41,800	76	12/14/39	Negative
4	9½	F	W	12/14/39	3	46,300	88	12/15/39 12/22/39 1/ 6/40	Negative
5	11	F	N	12/27/39	2½	34,700	80	1/ 3/40	Negative
6	9½	F	W	1/ 8/40	3	29,000	82	1/13/40 1/20/40 1/29/40	Negative
7	7	F	W	1/16/40	4½	59,300	93	1/18/40	Negative
8	11	F	W	1/20/40	1½	18,400	71	1/22/40	Negative
9	7	F	W	2/12/40	2½	42,300	87	2/11/40 2/17/40 2/20/40 2/27/40 3/ 4/40	Negative
10	9½	F	W	2/17/40	3	40,100	84	2/20/40 2/27/40 3/ 4/40	Negative
11	12	F	W	2/28/40	1½	27,600	72	2/29/40 3/ 4/40	Negative
12	7½	F	W	3/22/40	2½	56,600	76	3/23/40 3/30/40 4/ 7/40	Negative
13	13½	M	W	3/27/40	2	19,700	71	3/27/40 4/ 3/40	Negative
14	10	F	W	5/ 4/40	5½	32,100	85	5/ 5/40 5/12/40 5/20/40 5/30/40 6/ 6/40	Negative
15	8½	F	W	5/ 6/40	2	27,300	80	5/ 7/40 5/15/40	Negative
16	7	F	W	5/28/40	4	31,900	84	5/30/40 6/ 6/40 6/13/40 6/20/40	Negative

OBSERVATIONS

Blood Picture.—The characteristic finding in all these cases was a striking rise in the total leukocyte count. The maximum counts of the 16 children varied from 59,300 to 18,400 cells per cubic millimeter. The differential count showed that this rise was due to the marked increase in the number of mononuclear cells. The percentage of lymphocytes rose to a maximum of 90 per cent and was never lower than 71 per cent at the height of the disease. There was a relative but not an absolute decrease in the polymorphonuclear cells.

The increase in cells was due chiefly to an increased number of small lymphocytes, which appeared to be entirely normal. In each instance, the percentage of lymphocytes reached its maximum at the time when the total count was highest. The percentages of large lymphocytes and monocytes were not increased, and no lymphoblasts were found. The large lymphocyte typical of infectious mononucleosis was not present.

The total number of leukocytes increased fairly rapidly until the peak was reached. After remaining elevated for a short time the count gradually returned to normal. The total number of leukocytes decreased, and the percentage of polymorphonuclears increased. The beginning of the disease was not discovered in all the children, but the general pattern was so characteristic that a second count showed whether the condition was progressing or declining.

Serologic Data.—As shown in table 1, the results of the Paul-Bunnell test were negative for all 16 patients.

TABLE 2.—*Monthly Incidence of Cases of Infectious Mononucleosis*

Month	Number of Cases
October	1
November	1
December	3
January	3
February	3
March	2
April	0
May	3
Total	16

Falsely positive Wassermann reactions have occasionally been reported in patients with infectious mononucleosis,[2] but reactions to the Wassermann tests done on 5 of the children were negative.

Epidemiologic Data.—This epidemic differs from others in its low infectivity. The cases occurred sporadically over a period of six months, as shown in table 2.

The first patient, who introduced the infection, was admitted on October 10 and the second case of the disease was not detected until November 27, forty-eight days later. Of the 15 cases developing here, 14 occurred in girls (13 white, and 1 Negro) and only 1 in a boy (patient 13, table 1).

The 66 girls were distributed among three dormitories, irrespective of age. The girls of one dormitory remained entirely free of the infection; the disease developed in 8 girls of the second dormitory and in 6 of the third. The 42 boys were distributed bewteen two dormitories, also without regard to age. Boys and girls attended the same classes in school and ate in the same dining room, though at different tables. For

2. Bernstein, A.: Infectious Mononucleosis, Medicine **19**:87, 1940.

recreational purposes, the boys were divided into two groups and the girls into three, according to age.

Age Incidence.—Nine of the 16 cases occurred among the youngest girls, who ranged in age from 6 to 10 years and who played together in the same recreational group. Six cases were divided equally among the intermediate and senior girls. It is of interest that the only boy who contracted the infection was one of the older children and that no other cases developed either in his dormitory or in his recreational group.

Incubation Period.—Previous reports on the length of the incubation period of infectious mononucleosis vary from one to twenty-eight days.[2] In this outbreak there was apparently a great variation in the susceptibility of the same child at different times. For example, a child who was admitted at the same time as the first patient and was in intimate contact with her in the admitting ward did not contract the infection until three months later (patients 1 and 7, table 1). Two girls who were recovering from recurrences of rheumatic fever and occupied adjoining beds in the same cubicle for nine days will serve as a second example. After they had been together for six days, a routine leukocyte count revealed that 1 of these children had infectious mononucleosis (patient 4). The disease did not develop in the other girl until two months later (patient 10).

The second case developed approximately forty-eight days after the introduction of the first patient into the community. In view of the marked variation in susceptibility of the same child at different times, it was impossible to determine the origin of subsequent cases of the infection with any certainty. The disease developed in 2 girls belonging to the youngest age group, patients 14 and 15, in May, forty-three days after the disease appeared in patient 12. It was considered more likely that these 2 girls contracted the infection from patient 12 than from patient 13, since the latter patient was an older boy who had little contact with the younger girls.

Experimental Investigation.—The cause of infectious mononucleosis is unknown, but it is generally considered to be an infectious agent. This outbreak of infectious mononucleosis, in spite of the lack of clinical symptoms, also suggests that a specific infectious agent was responsible because of the mode of spread and the constancy of the hematologic findings.

It has been shown that the injection of Listerella monocytogenes into rabbits produces a blood picture similar to that found in patients with infectious mononucleosis,[3] and observers [4] have occasionally iso-

3. Murray, E. G. D.; Webb, R. A., and Swann, M. B. R.: A Disease of Rabbits Characterized by a Large Mononuclear Leucocytosis, Caused by a Hitherto Undescribed Bacillus, Bacterium Monocytogenes (n. sp.), J. Path. & Bact. **29**: 407, 1926.

(Footnotes continued on next page)

lated organisms belonging to this group from the blood and throats of such patients. It was, therefore, thought of interest to study the effect of the injection of unfiltered throat washings and plasma into rabbits. Material for this purpose was collected from 2 of the patients at the onset of the disease.

Preliminary blood counts were done on the rabbits on three successive days. After the injection of throat washings and plasma obtained from patients 13 and 14, blood counts were made daily for one week. The rabbits remained well, and no change in the total leukocyte or differential counts occurred. For 2 rabbits the heterophil titer was determined before and after injection. No rise in agglutinins for sheep erythrocytes was noted.

To show that the animals used were capable of giving a monocytic response, from two to four weeks later appropriate amounts of a suspension of L. monocytogenes D 82 N [5] were injected into the same rabbits. In all 4 of the rabbits a typical monocytic reaction characteristic of monocytogenic infections in these animals developed. No rise in heterophil antibodies followed the injection of this organism.

Attempts were made to isolate L. monocytogenes from the throats of some of the children, with negative results. In view of the mildness of the infection, it was thought useless to make blood cultures.

COMMENT

A careful review of the literature showed that only a single clearcut case of infectious mononucleosis without clinical symptoms or positive physical manifestations has been reported.[6] Previous epidemics in institutions have usually been accompanied by symptoms or glandular enlargement. The occurrence of 16 cases in children in whom careful physical examinations by several observers failed to reveal any abnormality is unusual. It is possible that this outbreak may have differed from those previously reported in that the infection was limited to the mesenteric or mediastinal lymph nodes. However, this seems unlikely since none of the children complained of abdominal pain or had coughs.

It is well known that the clinical picture of infectious mononucleosis may vary greatly. It is the variability of the clinical findings which has given rise to the large number of names which have been applied to this disease. In a recent review, Bernstein [2] concluded that infectious

4. (*a*) Nyfeld, A.: Etiologie de la mononucléose infectieuse, Compt. rend. Soc. de biol. **101**:590, 1929. (*b*) Pons, C. A., and Julianelle, L. A.: Isolation of Listerella Monocytogenes from Infectious Mononucleosis, Proc. Soc. Exper. Biol. & Med. **40**:360, 1939.

5. This culture was obtained through Dr. Louis A. Julianelle.

6. Wilson, C. P., and Cunningham, R. S.: Consideration of Supravital Method of Studying Blood in Cases of Mononuclear Cell Response, Folia haemat. **38**:14, 1929.

mononucleosis is the most satisfactory term, since the diagnosis of this condition depends not on any particular clinical finding but on the characteristic blood picture.

The most striking feature of the blood picture is an absolute increase in the monocytic elements of the blood, demonstrable at some time during the course of the disease. Leukocytosis may or may not be present. Large abnormal lymphocytes with fenestrated nuclei and diffuse chromatin are considered characteristic of infectious mononucleosis. However, often no abnormal forms are present, and only large numbers of apparently normal lymphocytes are found.

In view of the variability not only of the clinical findings but of the blood picture, the discovery by Paul and Bunnell that the serums of patients with infectious mononucleosis agglutinate sheep erythrocytes in high dilution is often an aid in diagnosis. However, it is well known that the reaction of patients with the disease to this test is not always positive. Negative results have been obtained in typical cases, especially in children.

It seems possible, as Davidsohn[7] has suggested, that infectious mononucleosis should be divided into two types according to the result of the Paul-Bunnell test. However, until the etiologic agent of this disease is discovered and the rise of heterophil antibodies is adequately explained, it seems best to classify these cases as instances of infectious mononucleosis in spite of the negative serologic findings.

It is of interest that some of the 16 children in whom this condition developed later contracted two different types of infections of the upper respiratory tract: streptococcic sore throats or epidemic influenza, With each type, the response to the particular infection was typical: leukocytosis with an increased percentage of polymorphonuclear cells in the case of the streptococcic infections and leukopenia with the influenza, indicating that these children were capable of responding specifically to different types of infections.

The low infectivity in this outbreak is notable. Infection in most diseases is thought to depend on two main factors: the size of the infecting dose and the susceptibility of the patient. In this series of cases, the size of the infecting dose appeared to be of less importance than susceptibility, which varied at different times in the same child.

In most of the reported epidemics of infectious mononucleosis, the number of cases rose sharply and then declined. In this outbreak, occurring in a stable community, new cases developed at approximately the same rate over several months.

It is difficult to draw definite conclusions in regard to the length of the incubation period in this outbreak. The varying susceptibility of

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7. Davidsohn, I.: Serological Diagnosis of Infectious Mononucleosis, J. A. M. A. **108**:289 (Jan. 23) 1937.

the same child at different times made it impossible to be sure which particular exposure caused the disease.

The interval between the introduction of the first patient with the disease into the community and the appearance of the second case was approximately forty-eight days. If the disease developed in the third and fourth patients as a result of their exposure to the second patient, the incubation period was sixteen to seventeen days. However, at the end of the epidemic, evidence indicating that the incubation period was forty days or longer was again obtained. It seems possible, therefore, that patients 3 and 4 may have been infected by patient 1 instead of by patient 2. One explanation of the long incubation period may be that intervening cases were missed, but this does not seem likely. Leukocyte counts were done frequently on all the children in the institution during the winter months, because infections of the upper respiratory tract were prevalent, and the children were carefully watched for rheumatic manifestations. The longest incubation period previously reported is twenty-eight days. It may be that the incubation period tends to be shorter in clinically more virulent types of the disease.

In previous epidemics of infectious mononucleosis the clinical picture during the course of the outbreak usually showed a tendency to vary. In addition to clinically typical cases, some of the patients had only minor symptoms, which might have been overlooked in the absence of an epidemic. The complete lack of symptoms which characterized the 16 cases in this outbreak remained constant. No evidence was obtained to indicate that the virulence of infections of the upper respiratory tract or of rheumatic fever was enhanced by the agent of infectious mononucleosis.

In spite of the absence of clinical symptoms or positive physical manifestations, the condition in these cases should, in our opinion, be classified as infectious mononucleosis because of the characteristic blood picture and the infectious nature of the epidemic.

CONCLUSIONS

Sixteen cases of an atypical form of infectious mononucleosis occurring in a sanatorium for rheumatic children have been described.

This outbreak differs from those previously reported in that none of the children had symptoms or physical manifestations of any kind. The diagnosis was made entirely on the basis of the blood picture, which was characterized by a high leukocyte count, with a striking increase in apparently normal lymphocytes.

The results of the Paul-Bunnell test were uniformly negative.

No evidence was obtained that the disease was due to an infection with organisms of the L. monocytogenes group.

LEAD POISONING

A CLINICAL AND EXPERIMENTAL STUDY OF THE FACTORS INFLUENCING THE SEASONAL INCIDENCE IN CHILDREN

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AND
MITCHELL I. RUBIN, M.D.
PHILADELPHIA

Examination of the records of patients with lead poisoning admitted to the Children's Hospital of Philadelphia revealed a seasonal incidence in the onset of encephalopathic symptoms. Figure 1 shows the monthly distribution of onset of symptoms of the patients with frank lead encephalopathy admitted to this hospital.

In constructing this figure only patients with frank encephalopathic symptoms of rather acute onset were counted; patients with latent or subclinical plumbism, usually discovered accidentally, who exhibited no obvious encephalopathic symptoms were not included. It is apparent from figure 1 that almost all of the cases occur during the late spring and summer months. Shelling and Hopper [1] commented on the same seasonal incidence of the cases studied in the Harriet Lane Home.

We assumed that there was a real relation, probably causal, between the summer season and the increased severity of lead poisoning and planned experiments to examine the seasonal factors which were possibly operative in determining this relation. In this investigation a study was made of the effect of two meteorologic phenomena, increased temperature and increased solar radiation, which occur during the summer season on the severity of lead poisoning in rats.

EXPERIMENTAL STUDY

Albino rats raised in our laboratory colony were used in all experiments. Rats weighing in the neighborhood of 60 to 100 Gm. were selected, for we had found that it was difficult to produce appreciable poisoning in heavier animals with the

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This study was aided by a grant from Mead, Johnson & Co.

Read in part at the ninth annual meeting of the Society for Pediatric Research, Atlantic City, N. J., May 4, 1937.

From the Department of Pediatrics, University of Pennsylvania School of Medicine, and the Children's Hospital.

An abstract and discussion of the paper appeared in the transactions of the Society (Am. J. Dis. Child. **54**:1184 [Nov.] 1937).

1. Shelling, D. H., and Hopper, K. B.: Calcium and Phosphorus Studies, Bull. Johns Hopkins Hosp. **58**:137, 1936.

amount of lead administered and that very small animals were so severely poisoned that it was not possible to feed them our lead-containing diet for long periods. The diet of the animals before the administration of lead was the breeder's diet used in rearing our rat colony. The composition of this diet is given in table 1.

EXPERIMENT 1.—*Influence of Increased Environmental Temperature on Severity of Lead Poisoning.*—Forty-nine rats, 24 male and 25 female, were used in this experiment. Throughout this experiment all animals were kept in a dark room to eliminate the effects of solar radiation as a disturbing factor. Four male

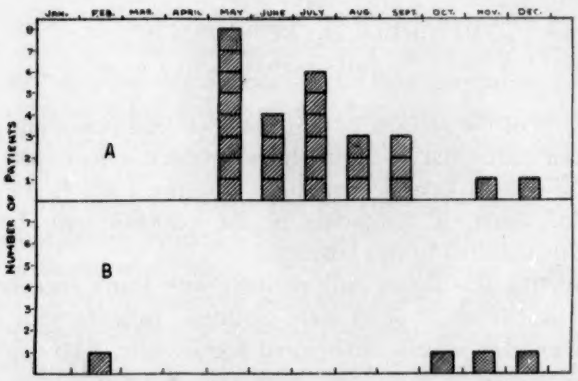

Fig. 1.—Monthly distribution of onset of encephalopathic symptoms (*A*) in patients who did not and (*B*) in patients who did receive vitamin D during period of ingesting lead.

TABLE 1.—*Composition of Breeder's Diet* *

	Gm.
Whole ground wheat	660
Whole ground corn	680
Whole milk powder	420
Linseed oil meal	140
Alfalfa meal	40
Calcium carbonate	10
Sodium chloride	10
Dried brewers' yeast	100

* The diet contains 5.7 mg. of calcium and 3.4 mg. of phosphorus per gram.

and 5 female animals were maintained on the breeder's diet as controls. The remaining animals were given a diet containing lead (the breeder's diet to which was added 1.5 per cent by weight of basic lead carbonate [$Pb(OH)_2 \cdot 2\ Pb\ CO_3$]). On the thirty-second day of lead ingestion, when the toxic effect of lead was evident from the flattening of the weight curves, the rats were divided into four groups, as follows:

Group 1. Rats which continued to receive the diet containing lead and were kept at room temperature.

Group 2. Rats which continued to receive the diet containing lead and were exposed to an external temperature of 40 C. for four hours daily.

Group 3. Rats which resumed ingestion of the normal breeder's diet and were kept at room temperature.

Group 4. Rats which resumed ingestion of the normal breeder's diet and were exposed to an external temperature of 40 C. for four hours daily.

The rats exposed to heat were placed in a box in which the temperature was maintained fairly constant at 40 C. by a bank of lamps. A four hour daily exposure seemed to be as much as the animals, both the normal ones and those poisoned by lead, could tolerate, for at the end of that time they were inert and listless. Exposure to a temperature of 40 C. for four hours usually raised the rectal temperature of the rat from 1 to 2 degrees (C.).

Results.—In figure 2 are shown the average weight curves for the male animals in groups 1 and 2. Since effects of the experiment on the weight of the female animals were identical, weight curves for them

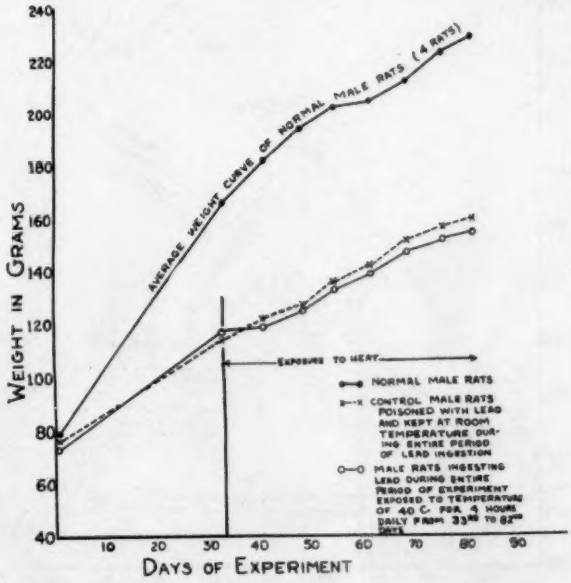

Fig. 2.—Effect on weight of exposing rats to heat during period of ingesting lead.

are omitted. It is apparent that exposure to heat did not appreciably increase the severity of lead poisoning in animals ingesting lead, since the average weight curves for groups 1 and 2 are similar and no gross differences in the two groups could be detected. Figure 3 shows the average weight curves for the male animals in groups 3 and 4. Exposure to heat apparently did not influence the rats which had lead stored in their bodies but were no longer ingesting lead.

These results, which indicate that increased environmental temperature is without influence on the toxicity of ingested or stored lead in the rat, differ from those obtained by Blackman [2] from study of the effect

2. Blackman, S. S., Jr.: The Lesions of Lead Encephalitis in Children, Bull. Johns Hopkins Hosp. **61**:1, 1937.

of heat on lead poisoning in rabbits. He found that exposure of rabbits which had received lead parenterally to a temperature of 37 C. usually produced encephalitis within twenty-four hours. However, he stated that fever developed in the animals, the temperature rising 3 to 4 degrees (C.) during the period of exposure. That febrile disturbances will produce acute exacerbations of lead poisoning is a clinical fact. While this may be due partially to vasodilatation produced by fever, as Blackman suggested, altered metabolic factors, for example, acidosis, with resultant increased mobilization of lead from the bones, may also play a part.

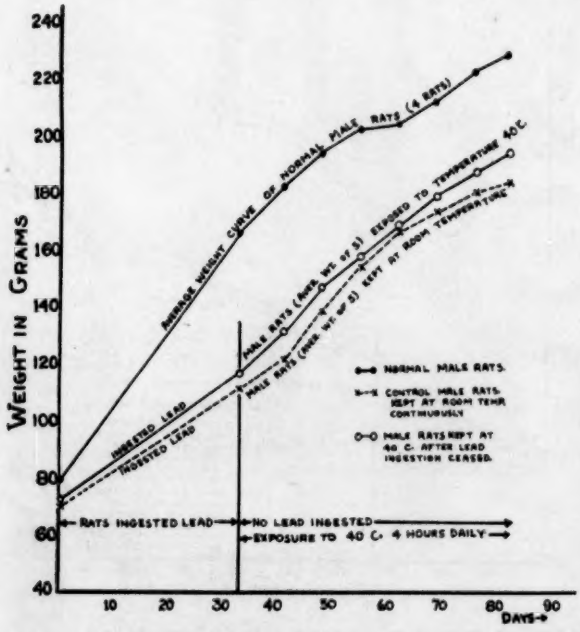

Fig. 3.—Effect on weight of exposing rats to heat after period of ingesting lead.

Obviously, the results of Blackman's experiment are not applicable to the seasonal incidence of lead encephalopathy in human beings. There is a greatly increased incidence during the late spring, when the environmental temperatures are not elevated to excessive levels, certainly to no level that will result in a rise of the body temperature. The difference in our experimental results and those of Blackman may lie in the fact that different animals were used and different periods of exposure to heat were employed.

EXPERIMENT 2A.—*Influence of Increased Solar Radiation on Lead Poisoning in Rats.*—A group of 48 rats, 24 male and 24 female, was used to study the influence of exposure to sunlight on rats ingesting lead during the period of exposure. These animals were divided into four groups.

Group 5. Rats which were fed the normal breeder's diet and were exposed to the sun daily (control group).

Group 6. Rats which were fed the diet containing lead and were kept in a dark room during the entire experiment.

Group 7. Rats which were fed the diet containing lead and were kept in a dark room during the entire experiment but were given a daily supplement of 0.2 cc. of cod liver oil U. S. P.

Group 8. Rats which were fed the diet containing lead and were exposed to the sun daily.

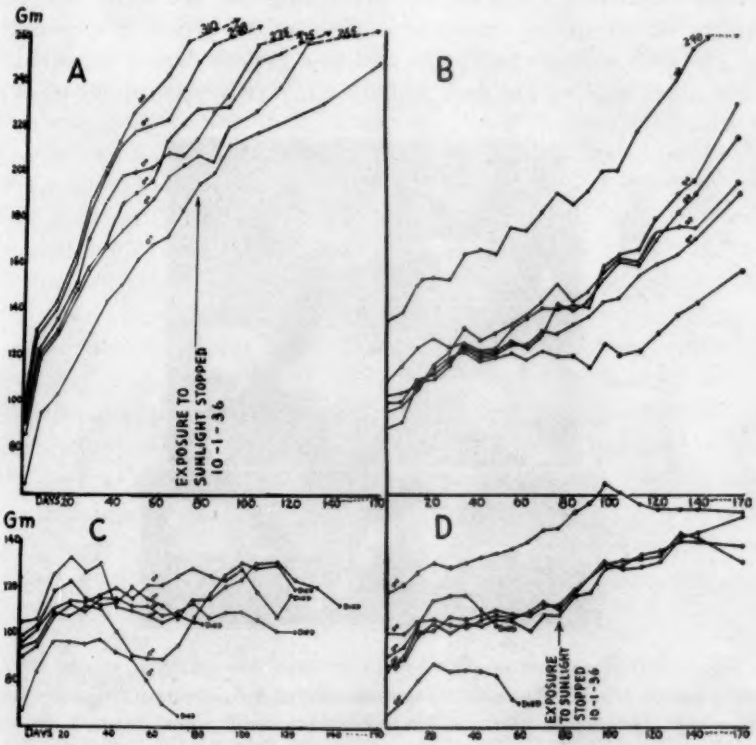

Fig. 4.—Effect on weight of male rats of exposure to sunlight and ingestion of cod liver oil during period of ingesting lead. *A*, rats fed breeder's diet and exposed to sunlight two hours daily. *B*, rats poisoned with lead and kept in the dark. *C*, rats poisoned with lead, kept in the dark and given 0.25 cc. of cod liver oil daily. *D*, rats poisoned with lead and exposed to sunlight two hours daily.

The daily exposures to sunlight were for two hour periods on the roof of the hospital, from the middle of July to October, when there is maximal solar radiation in Philadelphia.[3]

3. Bliss, G. S.: Annual Meteorological Summary with Comparative Data (Philadelphia, Pa.), United States Department of Agriculture, Weather Bureau, 1939.

Results.—Figure 4 shows the weight curves for the 24 male animals in groups 5 to 8. Since the effects on the weight of the female animals were identical, weight curves for them are omitted. That the control group of animals fed the breeder's diet grew normally was determined by comparing their average weight curve with the average weight curve of other normal male rats in our colony. The rats receiving lead and kept in the dark showed retardation of growth, but they appeared "healthy" in that their coats were sleek and they were active. The animals which were given the diet containing lead and were exposed to sunlight were adversely influenced. During the period of exposure to sunlight their weights were depressed to a greater degree than those of the animals kept in the dark (group 6). They seemed ill, they had

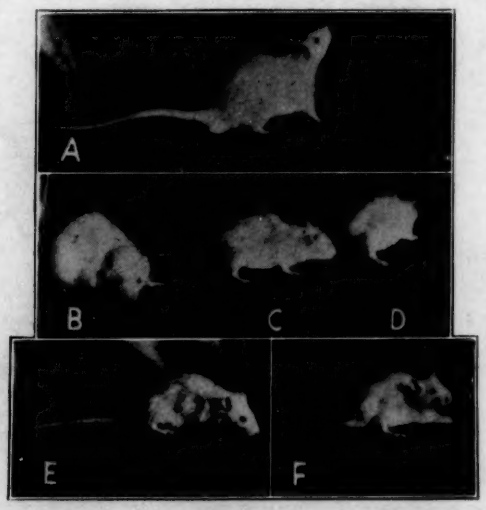

Fig. 5.—Effect on rats of exposure to sunlight and ingestion of cod liver oil during period of ingesting lead. *A*, normal control, fed breeder's diet and exposed to sunlight two hours daily. *B*, rat poisoned with lead and kept in the dark. *C* and *E*, rats poisoned with lead and exposed to sunlight two hours daily. *D* and *F*, rats poisoned with lead and given 0.25 cc. of cod liver oil daily.

dirty coats and they were inactive; 1 animal died. It is also significant that with the cessation of exposure to sunlight the weight curves of these animals improved, even though they continued to ingest lead. The animals of group 7, which received daily supplements of cod liver oil while eating the diet containing lead, were most seriously affected; all of them died.

This experiment demonstrates conclusively that exposure to sunlight has a deleterious effect on rats which are ingesting lead. That this is probably due to the vitamin D–producing action of sunlight is suggested

by the effects produced on the animals fed daily supplements of cod liver oil. It is well known that the metabolism of lead is much like that of calcium.[4] Since agents with vitamin D–producing action increase the absorption of calcium from the gastrointestinal tract, it is reasonable to assume that they have a similar influence on the absorption of ingested lead. A constantly increased absorption of lead would produce a higher concentration of lead in the body fluids, with a resultant increase in damage to the exposed vital tissues. That vitamin D does increase the concentration of lead in the blood of rats ingesting lead has been demonstrated by Sobel and his associates.[5]

Before stating conclusively that sunlight increases the severity of lead poisoning by virtue of its vitamin D–producing action, we deemed it essential to investigate the combined effect of exposure to sunlight and the increased amounts of porphyrin known to be present in the body of the animal poisoned with lead. It has been adequately demonstrated that considerable quantities of coproporphyrin III are excreted by persons with plumbism.[6] Gelman[7] attributed many of the symptoms of lead poisoning (for example, colic and the disturbances referable to the central nervous system) to the circulating porphyrins and pointed out the parallelism in the symptoms of lead poisoning and porphyrinuria. It is well known that porphyrins are sensitized by ultraviolet light and may become powerful proteolytic enzymes after sensitization.[8] This sensitization of the circulating porphyrins in a person with lead poisoning by the increased solar radiation of summer is one possible explanation of the sudden onset of symptoms at this time of the year. It is interesting to note that Schreus and Carrié[9] demonstrated increased cutaneous sensitivity to ultraviolet light in a patient with lead poisoning, which they imply was due to the porphyria present.

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4. Aub, J. C.; Fairhall, L. T.; Minot, A. S., and Reznikoff, P.: Lead Poisoning, in Medicine Monographs, Baltimore, Williams & Wilkins Company, 1926, vol. 7. Aub, J. C.: Biochemical Behavior of Lead in the Body, J. A. M. A. **104**:87 (Jan. 12) 1935. Shelling, D. H.: Effect of Dietary Calcium and Phosphorus on Toxicity of Lead in the Rat, Proc. Soc. Exper. Biol. & Med. **30**:248, 1932.

5. Sobel, A. E.; Yuska, H.; Peters, D. D., and Kramer, B.: The Biochemical Behavior of Lead, J. Biol. Chem. **132**:239, 1940.

6. Vannoti, A.: Klinik und Pathogenese der Porphyrien, Ergebn. d. inn. Med. u. Kinderh. **49**:337, 1935.

7. Gelman, I.: Zur Klinik und Genese der Bleikrisen, Deutsches Arch. f. klin. Med. **163**:1, 1929.

8. Boyd, M.: Hematoporphyrin, an Artificial Proteolytic Enzyme, J. Biol. Chem. **103**:249, 1933.

9. Schreus, H. T., and Carrié, C.: Ueber den Zusammenhang der Symptome der Bleigiftung mit der Porphyrinausscheidung auf Grund von Untersuchungen bei Bleikranken, Ztschr. f. klin. Med. **125**:330, 1933.

EXPERIMENT 2B.—*Influence of Porphyria and Its Relation to Exposure to Sunlight.*—Thirty-seven rats were used in this experiment. Eight animals, 4 male and 4 female, served as controls. They were kept on the normal breeder's diet, and, beginning on the forty-seventh day of the experiment, were exposed to the midday sun for two hours daily. The remaining 29 animals were kept in a dark doom and were fed the diet containing lead for forty-seven days. At the end of this period the diet containing lead was replaced with the normal breeder's diet, and the animals were divided into three groups, as follows:

Group A. Rats kept in a dark room during the remainder of the experiment.

Group B. Rats kept in a dark room and fed a daily supplement of 0.2 cc. of cod liver oil U. S. P.

Group C. Rats exposed to the midday sun for two hours daily.

At this time and thirty-one days later, the daily excretion of porphyrin by the animals was estimated. Pairs of rats from each of the poisoned groups and the normal group were placed in metabolism cages, and their urine was collected for periods of two to five days.

Results.—In table 2 the data on the excretion of porphyrin by normal and by poisoned animals are summarized.

TABLE 2.—*Daily Urinary Excretion of Porphyrin by Rats*

	Porphyrin, Micrograms per Day
(1) Normal rats	0.3 to 2.7
(2) Rats at end of 47 day period of ingesting lead	24 to 30
(3) Same rats as (2) 31 days later	14 to 16

It is apparent from these data that the rats poisoned with lead excreted excessive amounts of porphyrin, presumably coproporphyrin III, although this is not known with certainty since the porphyrin was not isolated for identification. The excretion of porphyrin by the normal animals was in keeping with the values recorded for normal rats in the literature (Rimington[10]). The excretion by the animals poisoned with lead for forty-seven days was definitely increased, being 24 to 30 micrograms daily as compared with the normal excretion of 0.3 to 2.7 micrograms. It is pertinent that the increased excretion continued for a considerable period after the ingestion of lead had stopped. Thus, thirty-one days after the withdrawal of lead from the diet, the excretion of porphyrin was still at least five times as great as normal. This is analogous to what is known to occur in the human subject.[9]

As evidence of the fact that rats with an increased production of porphyrin are sensitive to sunlight, Rimington demonstrated cutaneous

10. Rimington, C.: Porphyrinuria Following Sulphanilamide, Lancet **1**:770, 1938.

photosensitivity in rats excreting increased amounts of coproporphyrin III during and after administration of sulfanilamide, although he stated that this photosensitivity is of low degree.

Figure 6 shows the average weight curves of the male and the female rats in groups A, B and C. It was impossible to differentiate these three groups of animals by inspection. In contrast to the markedly injurious effects of administration of vitamin D on animals ingesting lead, the rats which had received lead prior to but not during the period in which cod liver oil was fed were not adversely affected. The animals exposed to sunlight after the cessation of lead feeding tended to have slightly lower weights than the rats in groups A and B. Since these

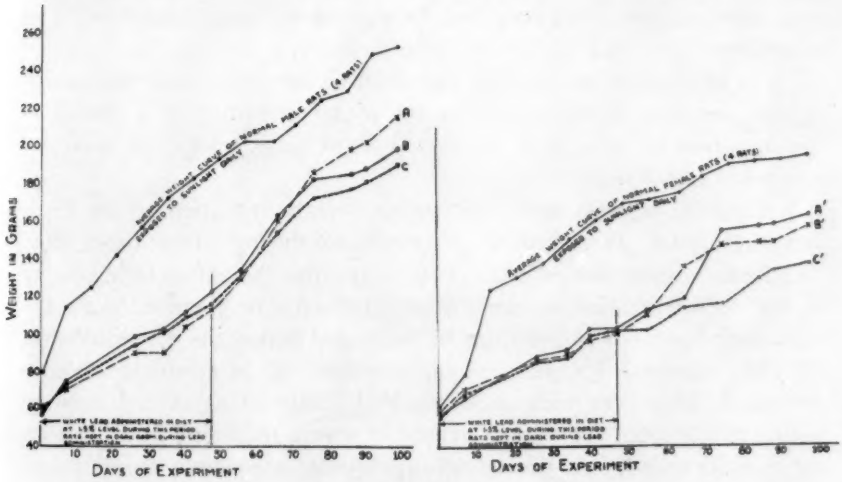

Fig. 6.—Effect on weight of rats of exposure to sunlight and ingestion of cod liver oil after period of ingesting lead. Average weight curves (*A*) of 4 male and (*A'*) of 5 female rats kept in dark room after ingesting lead for forty-seven days, (*B*) of 5 male and (*B'*) 5 female rats fed 0.2 cc. of cod liver oil daily and kept in the dark after ingesting lead for forty-seven days, and (*C*) of 5 male and (*C'*) of 5 female rats exposed to midday sunshine for two hours daily after ingesting lead for forty-seven days.

animals were still excreting porphyrin in excessive amounts, this seems to indicate that photosensitization of porphyrin may have a mildly deleterious effect on the animal with plumbism, but certainly this is of much smaller moment than the effect of the vitamin D–producing action of sunlight.

COMMENT

A vitamin D–producing agent, either sunlight or cod liver oil, probably injures the rat ingesting lead by increasing the amount of lead absorbed from the gastrointestinal tract. The photosensitizing action of

sunlight on porphyrins may play a minor role in contributing to the severity of plumbism, for exposure to sunlight of animals excreting porphyrins in increased amounts seemed to produce a slight increase in the severity of poisoning.

These experiments permit the formulation of the following explanation for the increased incidence of severe lead poisoning in infants and children during the summer months. During the winter months the child who ingests lead and does not receive vitamin D will absorb only small amounts of lead, quantities insufficient to raise the concentration of lead in the body fluids high enough to precipitate serious poisoning. With exposure to the increased solar radiation of summer while the ingestion of lead is continued at the same level, there is an increased absorption of lead, with resultant increased toxicity and appearance of symptoms.

It is of interest to note that the children in whom acute symptoms of lead poisoning developed during the winter months gave a history of the inception of vitamin D therapy a short time before the onset of symptoms (fig. 1).

Of the 30 patients with lead encephalopathy admitted to the Children's Hospital, 24 had onset of symptoms during May, June, July, August and September, months of the year when the antirachitic activity of the solar radiation in the Philadelphia area is greatest.[11] In the remaining 6 patients encephalopathy developed during the winter months. Of these patients, 4 were receiving cod liver oil in adequate amounts during the time they were ingesting lead. The taking of cod liver oil might well account for the occurrence of severe poisoning in other than the summer months, for the animal experiments adequately demonstrated the adverse influence of vitamin D feeding on lead intoxication. Of the 2 patients in whom lead encephalopathy occurred in the winter months and who did not receive cod liver oil, 1 was poisoned by the inhalation of lead fumes. Since we believe that the experiments show that vitamin D exerts its deleterious effect by promoting the absorption of lead from the intestinal tract, it is apparent that vitamin D would be without influence in a patient receiving lead by inhalation. The remaining case of lead encephalopathy which occurred in the winter, in December, in a patient who received no cod liver oil is in contrast to the cases of the 24 patients whose symptoms appeared in the summer months.

We believe that it is fair to assume that the heat of the summer is not the important factor in precipitating lead encephalopathy in a child

11. Clark, J. H.: Annual Variation in the Antirachitic Radiation from Sun and Sky in Baltimore, Am. J. Hyg. **12**:690, 1930. Clark, J. H.: The Zinc Sulfide Method of Measuring Ultraviolet Radiation and the Results of Three Years' Observation on Baltimore Sunshine, J. Optic. Soc. America **21**:240, 1931.

ingesting lead, for in 8 of our patients symptoms developed during May, when the temperature in the region of Philadelphia is not excessive.

The animal experiments further suggest that the photosensitizing action of sunlight on the increased amounts of porphyrin known to be present in persons with plumbism may contribute in small measure to the seasonal incidence of severe lead poisoning.

SUMMARY

Lead encephalopathy in infants and children has its greatest incidence in the spring and summer months.

This seasonal incidence seems dependent on the vitamin D–producing action of sunlight, which increases the absorption of ingested lead.

The sensitization by sunlight of the increased amounts of porphyrin present in persons with plumbism may contribute to this seasonal incidence.

Dr. William Strain, of the University of Rochester, made the quantitative determinations of porphyrin.

1740 Bainbridge Street.

EXCRETION OF MANDELIC ACID IN BREAST MILK

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Organic acids have been used successfully in the treatment of infections of the urinary tract since the introduction of the ketogenic diet by Clark [1] and Helmholz [2] in 1931. The bacteriostatic factor in this method of treatment has been shown to be betahydroxybutyric acid.[3] However, the complete oxidation of this substance, when taken orally by the nondiabetic subject, precluded its use in the efforts to replace the cumbersome and difficultly enforcible ketogenic regimen.[4] It remained for Rosenheim [5] to introduce mandelic acid, a nontoxic organic acid, which passes unchanged from the gastrointestinal system to the urinary tract. Its high urinary bacteriostatic property for certain infections, especially those caused by Bacillus coli and by Streptococcus faecalis in the presence of strongly acid urine (p_H 5.5 or less) has been amply confirmed by numerous investigators.[6]

A sufficient quantity of the drug must be given to maintain a 1 per cent concentration in the urine. As it is excreted practically unchanged, this can be achieved by administering 12 Gm. by mouth and limiting the intake of fluid to 1,200 cc. in twenty-four hours. These quantities are to be used for the average adult weighing 150 pounds (70 Kg.). To children, one may give a proportionately smaller dose of 0.18 Gm. per kilogram of body weight. The hydrogen ion concentration of the urine must be maintained at 5.5 or less. This can be accomplished by the use of ammonium chloride, dilute hydrochloric acid or the ketogenic diet. Culture of the urine should precede the use of the drug, as it is ineffective against Aerobacter aerogenes or Pseudomonas pyocyanea.

From the Medical and Obstetrical Services of the Richmond Memorial Hospital (Dreyfus Foundation).

1. Clark, A. L.: Proc. Staff Meet., Mayo Clin. **6**:605, 1931.
2. Helmholz, H. F.: Proc. Staff Meet., Mayo Clin. **6**:609, 1931.
3. Fuller, A. T.: Lancet **1**:885, 1933.
4. Fuller, A. T., and Colebrook, L.: Lancet **2**:735, 1933.
5. Rosenheim, M. L.: Lancet **1**:1032, 1935.
6. The *Quarterly Cumulative Index Medicus* lists 69 scientific articles on the value of mandelic acid and its salts in the treatment of infections of the urinary tract published since Rosenheim's original article appeared in 1935.

The renal function of the patient must be good, for inability to excrete the drug results in a lessened concentration of it in the urine and failure to achieve bacteriostasis and causes renal and hepatic irritation as well.[7] There must be adequate renal drainage, with no mechanical obstruction of the renal pelves, the ureters or the bladder.[8] The effectiveness of mandelic acid in the pyelitis of pregnancy is markedly inhibited by the changed anatomic conditions and the resultant inefficient drainage.[9]

The purpose of this study was to determine experimentally whether mandelic acid when used under optimal conditions is excreted in breast milk and if so whether the amount present is dangerous to the nursling.

Study of Six Mothers and Their Infants.—This study was carried out at the Richmond Memorial Hospital. Six patients consecutively admitted to the obstetric service were each given 12 Gm. of mandelic acid per day, starting on the first day after delivery. The daily intake of fluids was limited to 1,200 cc. The substance was administered in the following prescription:

	Gm. or Cc.
Saccharin solution	1
Ammonium chloride	50
Ammonium carbonate	80
Mandelic acid	200
Distilled water	400
Syrup of Althea to make	1,000

One-half ounce fluid (15 cc.) of this mixture was administered four times a day. None of the patients objected to its taste, and no untoward symptoms referable to the gastrointestinal tract were observed in any of the mothers.

Twenty-four hour specimens of urine were collected daily from these patients and examined quantitatively for mandelic acid. One-half ounce fluid (15 cc.) of breast milk was obtained daily from each patient by breast pump and subjected to quantitative analysis for the acid. It would have been desirable to collect twenty-four hour specimens of milk instead of the samples described, but this was manifestly impossible, as there was no contraindication to breast feeding in any instance and, as will be shown, it was desirable to observe the effect of the mandelic acid in the breast milk on the nursing children.

Samples of urine were obtained daily from the babies of the 6 patients and analyzed quantitatively for the acid. Unfortunately, twenty-four hour specimens of urine could not be obtained from the babies, owing to technical difficulties of collection. These specimens of urine were subjected to qualitative study for evidence of possible renal damage.

7. Braasch, W. F., in discussion on Cook, E. N.: Proc. Staff Meet., Mayo Clin. **12**:215, 1937.

8. Hunner, in discussion on Carroll, G.; Lewis, B., and Kappel, L.: J. Urol. **39**:710, 1938.

9. Ruther, H.: Zentralbl. f. Gynäk. **42**:2824, 1938.

The analyses were conducted according to a modification of the original Rosenheim [5] technic suggested by McMahon [10] and Rhodhamel (of Eli Lilly & Co.), which consisted of essentially the following procedure [11]:

The specimen was collected and measured, and a 25 cc. sample was acidified with 8 to 10 drops of phosphoric acid, then saturated with ammonium sulfate, using about 9 Gm. The solution was treated with ether five times, using 10 cc. of ether each time. The ether extract, which had a volume of approximately 50 cc., was dried with anhydrous sodium sulfate. The ether was evaporated and the residue dried in a weighed beaker in a vacuum. The weighed residue was dissolved in warm water and titrated with a half normal solution of sodium hydroxide, using congo red as an indicator. For each cubic centimeter of sodium hydroxide required for the titration there was present 0.076 Gm. of mandelic acid.

This technic was used for the specimens of breast milk as well as for the samples of urine. There was considerable difficulty in employing it for breast milk, as the mandelic acid probably combines in small quantities with other constituents of breast milk.[11] McMahon [10] noted that such combination with some of the constituents of normal urine also occurs. The control experiments verified this observation.

TABLE 1.—*Recovery of Mandelic Acid from Solution in Normal Urine*

Mandelic Acid Dissolved, Gm.	Volume of Normal Urine, Cc.	Mandelic Acid Recovered, Gm.	Percentage of Mandelic Acid Recovered
0.1	20	0.09185	91.85
0.1	20	0.08855	88.55
0.1	20	0.09372	93.72
0.1	20	0.09004	90.04

Control Experiments.—Before beginning the study on the 6 mothers and their infants, the following control experiments were performed:

Experiment 1: One-tenth gram of mandelic acid was dissolved in each of four 20 cc. samples of normal urine, which was free from sugar, albumin, casts, red blood cells and leukocytes. The samples were then analyzed, to see how much of the mandelic acid could be recovered.

The results, given in table 1, show recovery of about 90 per cent of the mandelic acid. Apparently 10 per cent was lost through combination with other urinary constituents or through inaccuracy of the method of analysis.

Experiment 2: One-tenth gram of mandelic acid was dissolved in 20 cc. of breast milk, and efforts were made to recover it as in the preceding experiment.

10. McMahon, S.: J. Urol. **41**:611, 1939.

11. Correspondence with the chemical department of Merck & Co. and the Surgeon General's office and study of thirty years of *Chemical Abstracts* with Dr. D. Davidheiser, professor of chemistry at Wagner College, failed to reveal a better method of analysis. The procedure is difficult with small samples, such as the specimens of baby urine and breast milk, as 1 drop of the half normal solution of sodium hydroxide often changed the color of the congo red. I believe this accounts in part for the fluctuations in the amount of acid recovered from the breast milk and the baby urine.

There was apparently a 20 per cent loss of mandelic acid, as shown in table 2. This indicates a combination of the acid with some of the constituents of breast milk.

Experiment 3: Four nonpregnant women who had normal urine were each given 12 Gm. of mandelic acid per day for two days, and an effort was made to recover the mandelic acid from the urine on the second day.

Table 3 shows that the percentage of recovery of mandelic acid from the urine of these 4 patients who took it orally was about 70 per cent.

TABLE 2.—*Recovery of Mandelic Acid from Solution in Breast Milk*

Mandelic Acid Dissolved, Gm.	Volume of Breast Milk, Cc.	Mandelic Acid Recovered, Gm.	Percentage of Mandelic Acid Recovered
0.1	20	0.08311	83.11
0.1	20	0.08045	80.45
0.1	20	0.08197	81.97
0.1	20	0.07989	79 89

TABLE 3.—*Recovery of Mandelic Acid from the Urine of Patients to Whom It Was Orally Administered*

Mandelic Acid Administered, Gm.	Fluid Intake for 24 Hr., Cc.	Volume of 24 Hr. Specimen of Urine, Cc.	Mandelic Acid Recovered, Gm.	Percentage of Mandelic Acid Recovered
12	1,200	1,070	8.274	69
12	1,200	942	7.913	66
12	1,200	1,108	8.241	68.5
12	1,200	896	7.927	66

RESULTS

Table 4 is a condensation of the information obtained on the 6 mothers and their infants and is self explanatory.[11a]

Column 5, which gives the percentage of mandelic acid recovered from maternal urine, shows that there was considerable variation in recovery. However, the mean percentage recovered was 60.96, which is considerably lower than the average of 70 per cent in subjects who were not nursing mothers. This would suggest a diversion of some of the mandelic acid from excretion in the urine to some other form of excretion. The figures in column 9, which give the approximate amount of mandelic acid in a twenty-four hour specimen of breast milk, were arrived at by figuring the average excretion of breast milk in twenty-four hours as 18 fluid ounces (540 cc.). This figure is obviously an approximation. However, as already explained, it was impossible to secure twenty-four hour specimens of breast milk. The amount of the acid in the breast milk varied considerably in different samples.

11a. Data on the 6 mothers and their infants are given in detail in a table included in the reprints of this article.

TABLE 4.—*Data on Excretion of Mandelic Acid by Six Mothers and Their Infants*

Case		Twenty-Four Hour Specimen of Maternal Urine				Breast Milk				Baby's Urine				
		Volume, Cc.	Amount of Mandelic Acid Recovered, Gm.	Mandelic Acid Content, per Cent	Percentage of Ingested Mandelic Acid Recovered	Volume of Sample, Cc.	Amount of Mandelic Acid Recovered, Gm.	Mandelic Acid Content, per Cent	Estimated Amount of Mandelic Acid Excreted in 24 Hr., Gm.	Volume of Sample, Cc.	Amount of Mandelic Acid Recovered, Gm.	Mandelic Acid Content, per Cent	Weight of Baby, Kg.	Estimated Amount of Mandelic Acid, Gm. per Kg. of Baby's Weight
1		2	3	4	5	6	7	8	9	10	11	12	13	14.
1	Maximum	2,865	10.733	1.23	89.44	15	0.00792	0.0594	0.297	10	0.007235	0.1079	3.22	0.093
	Minimum	792	8.237	0.290	68.64	7.6	0.00334	0.022	0.110	1	0.001079	0.0101	2.91	0.037
	Average	1,231	9.157	0.878	76.304	13.07	0.0057	0.0426	0.213	6.7	0.004579	0.0654	3.04	0.069
2	Maximum	1,420	12.438	1.07	103.65	20	0.01085	0.1085	0.5425	10	0.00821	0.0821	3.11	0.173
	Minimum	585	3.121	0.43	26	10	0.003617	0.024	0.12	3	0.00217	0.048	3.33	0.036
	Average	968	6.702	0.68	55.849	15	0.007099	0.0512	0.2562	8.2	0.00433	0.0479	3.19	0.079
3	Maximum	1,550	10.533	1.01	87.775	15	0.010941	0.074	0.370	11	0.00661	0.068	2.915	0.126
	Minimum	658	4.213	0.557	35.10	9.5	0.004161	0.0277	0.0385	2.1	0.00279	0.041	2.575	0.05
	Average	920	7.259	0.806	60.49	14.1	0.008123	0.0577	0.2749	6.9	0.00376	0.0513	2.759	0.102
4	Maximum	1,850	12.45	1.19	103.75	15	0.01091	0.1009	0.5045	10	0.00811	0.192	3.62	0.182
	Minimum	750	2.722	0.348	22.68	10	0.00311	0.0311	0.1555	3	0.00578	0.072	2.77	0.052
	Average	1,285	8.762	0.693	73.01	13	0.00826	0.0499	0.3052	7	0.006072	0.0884	2.87	0.108
5	Maximum	1,670	9.371	0.829	78.09	15	0.01191	0.079	0.395	14	0.00811	0.145	3.94	0.077
	Minimum	640	0.86	0.051	0.0716	15	0.00663	0.044	0.220	2.7	0.00161	0.0161	3.80	0.01
	Average	1,040	6.0573	0.543	40.4263	15	0.00855	0.057	0.283	8.6	0.00409	0.0564	3.879	0.062
6	Maximum	1,620	11.71	0.992	97.58	15	0.010271	0.0684	0.342	22	0.00761	0.054	3.25	0.109
	Minimum	600	5.482	0.722	45.68	8	0.005211	0.0474	0.237	7	0.00198	0.015	3.095	0.072
	Average	827	7.167	0.887	59.719	14	0.008615	0.0608	0.3037	13	0.00386	0.0294	3.163	0.096
	Grand average	1,045	7.5174	0.747	60.9664	14	0.007724	0.0532	0.2726	8.4	0.004448	0.0564	3.145	0.086

The average amount from all 6 mothers was 0.2745 Gm. per day. Column 14 shows the amount of mandelic acid imbibed by the babies in grams per kilogram of body weight. The infants received from 0.01 to 0.182 Gm. of mandelic acid daily, with an average of 0.086 Gm. The average adult dose is 0.18 Gm. per kilogram of body weight. Therefore, this study shows that this quantity is rarely exceeded by any appreciable amount in nursing babies whose mothers are receiving full doses of mandelic acid.

Each sample of baby urine was subjected to ordinary urinalysis. In no instance was there any evidence of renal damage from the mandelic acid in the urine. Microscopic examination never revealed any red blood cells or casts.

No attempt was made in this study to treat nursing babies with infection of the urinary tract by the administration of mandelic acid to their mothers, as no infants with such infections were available. This is, however, a conceivable therapeutic method. None of the mothers in this survey had infections of the urinary tract.

SUMMARY AND CONCLUSIONS

Mandelic acid is excreted in breast milk in quantities somewhat less than the normal daily dose of this drug, that is, 0.18 Gm. per kilogram of body weight. This study thus shows that babies of nursing mothers who are being given mandelic acid in normal dosage under ideal conditions of administration never get a dangerous amount of the drug. No clinical or laboratory evidence of damage to the nurslings of these mothers was found.

Dr. D. V. Catalano, attending obstetrician, and Dr. O. Auerbach, attending pathologist, of the Richmond Memorial Hospital (Dreyfus Foundation), cooperated in this work.

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NASAL FLORA OF THE CHILDREN IN A DAY NURSERY

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The number of varieties of bacteria in the normal flora of the nasal cavity is small, but the character of the flora undergoes interesting alterations, some of which are related to age, as may be gathered from various reports.[1] Bloomfield [1b] and Kneeland and Dawes [1c] reported that the human upper respiratory tract is sterile at birth but that by 8 months of age the infant has a nasal flora entirely comparable with that of adults. In general, investigators who have worked with adults have observed little change in the nasal flora during the common cold. On the other hand, when children were included in the study significant changes during colds were encountered more frequently.

Kneeland and Dawes [1c] observed 50 infants, both clinically and bacteriologically, over a period of two years and noted a parallel rise in the carrier rate of pathogenic organisms in the nose during two severe

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1. (*a*) Shibly, G. S.; Hanger, F. M., and Dochez, A. R.: Observations of Normal Bacterial Flora of Nose and Throat with Variations Occurring During Colds, J. Exper. Med. **43**:415 (March) 1926. (*b*) Bloomfield, A. R.: Variations in the Bacterial Flora of the Upper Air Passages During the Course of Common Colds, Bull. Johns Hopkins Hosp. **32**:121 (April) 1921. (*c*) Kneeland, Y., and Dawes, C. F.: The Relationship of Pathogenic Bacteria to Upper Respiratory Disease in Infants, J. Exper. Med. **55**:735 (May) 1932. (*d*) Webster, L. T., and Hughes, T. P.: The Incidence and Spread of Pneumococci in the Nasal Passages and Throats of Healthy Persons, ibid. **53**:535 (April) 1931. (*e*) Yardumian, K., and Lightner, E. L.: Nasopharyngeal Flora and Some Remarks as to Their Relation to Common Colds, J. Lab. & Clin. Med. **19**:877 (May) 1934. (*f*) Milam, D. F., and Smillie, W. G.: A Bacteriological Study of "Colds" on an Isolated Tropical Island (St. John, United States, Virgin Islands, West Indies), J. Exper. Med. **53**:733 (May) 1931. (*g*) Paul, J. H., and Freese, H. L.: An Epidemiological and Bacteriological Study of the "Common Cold" in an Isolated Arctic Community, Am. J. Hyg. **17**:517 (May) 1933. (*h*) Straker, E.; Hill, A. B., and Lovell, R.: A Study of the Nasopharyngeal Bacterial Flora of Different Groups of Persons Observed in London and South East England During the Year 1930-1937; Ministry of Health, Reports of Public Health and Medical Subjects. no. 90, London, His Majesty's Stationery Office, 1939.

outbreaks of respiratory infections in the winters. One year the pathogen was Haemophilus influenzae; the next it was Pneumococcus. Webster and Clow [2] observed, in cultures of material from the nose and pharynx, a definite relation between the presence of pneumococci, hemolytic streptococci and H. influenzae and the occurrence of coryza, sore throat, "influenza" and sinusitis.

In lobar pneumonia, both in adults and in children, there are departures from the normal nasal flora. Thus, Felty and Heatley [3] recovered pneumococci of the same type from the sputum and from the middle meatuses of the nose of each of 16 patients with lobar pneumonia. In studying series of children, Hodes and his associates,[4] Auger [5] and Poole and Fousek [6] used cultures of material from the nose for the rapid typing of pneumococci. Furthermore, in a series of 25 cases of pertussis in children, 17 of whom were infants, Bradford and Slavin [7] observed that the cultures of material from the nose were positive for Haemophilus pertussis in 14, cough plates were positive in 8 and cultures of material from the throat were positive in 4. In 3 cases in which the cough plate was positive and the culture of material from the nose was negative for H. pertussis, the patients were 4, 6 and 7 years of age.

Accordingly, it appeared of interest to collect more information about the nasal flora of so-called normal children, and to this end the population of a day nursery and the members of 2 families were studied.

MATERIAL AND METHOD

The clinical material consisted of the children attending the Leila Day Nursery in New Haven, the 6 adults who took care of them and the members of two physicians' families (5 children and 2 adults). The children of the nursery were divided according to the following age groups: 2 to 3, 3 to 4, 4 to 5, 5 to 6 and 6 to 8 years. The first group consisted of 7 children; the second group, 10; the third group, 9; the fourth group, 7 and the fifth group, 7. They were at the nursery from 8 a. m., to 5 p. m. daily. Each group of children had one room

2. Webster, L. T., and Clow, A. D.: The Association of Pneumococci, Hemophilus Influenzae, and Streptococcus Hemolyticus with Coryza, Pharyngitis, and Sinusitis in Man, J. Exper. Med. **55**:445 (March) 1932.

3. Felty, A. R., and Heatley, C. A.: The Nasal Passages in Lobar Pneumonia, J. A. M. A. **86**:1195 (April 17) 1926.

4. Hodes, H. L.; Stifler, W. C., Jr.; Walker, E.; McCarty, M., and Shirley, R. G.: Use of Sulfapyridine in Primary Pneumococcic Pneumonia and Pneumococcic Pneumonia Associated with Measles, J. Pediat. **14**:417 (April) 1939.

5. Auger, W. J.: An Original Method of Obtaining Sputum from Infants and Children, J. Pediat. **15**:640 (Nov.) 1939.

6. Poole, F. D., and Fousek, M. D.: The Etiologic Diagnosis of Pneumonia in Children by Rapid Typing of Nasal Cultures, J. A. M. A. **113**:1854 (Nov. 18) 1939.

7. Bradford, W. L., and Slavin, B.: Nasopharyngeal Cultures in Pertussis, Proc. Soc. Exper. Biol. & Med. **43**:590 (March) 1940.

in which they ate and played together, except the fourth and the fifth group, which went outside to school and came back to the nursery for luncheon and rest only. Most of the children were from poor families and lived under relatively similar environmental and social conditions in the crowded part of the city.

Every day a physician inspected the throat and the nose of each child on arrival at the nursery and made other physical examinations whenever indicated. The cultures of material from the nose were made five times a week; in addition, for each subject, including the adults at the nursery and the members of the physicians' families in the study, 1 culture a week was made, except for the children absent from the nursery. The swabs were used to inoculate the surface of blood agar plates. The plates were examined after twenty-four hours' incubation and were studied again after forty-eight hours, if necessary. The predominating types and relative numbers of colonies were determined by inspection. Pneumococci were tested for solubility in bile and were typed by Neufeld's technic, using serums of types 1 to 32. Streptococci were tested for hemolysin with washed rabbit cells. H. influenzae were identified by colony and by employing the Gram

TABLE 1.—*Incidence of Organisms in Cultures of Material from the Nose for Children and Adults in a Day Nursery and for Children Without Infection Admitted to the Hospital*

	Number of Cultures	Percentage Incidence							
		Pneumococci	H. Influenzae	Hemolytic Streptococci	Gram-Negative Cocci	Staphylococci	Diphtheroids	Nonhemolytic Streptococci	Unclassified Organisms
Day nursery									
40 children (2-8 yr.).....	629	44	26	5	50	50	30	4	5
6 adults (20-30 yr.).....	87	4	4	0	23	95	14	1	16
Hospital									
200 children (1-8 yr.).....	200	15	4	2	5	94	38	1	1

stain; frequently, the characteristic odor was helpful. In case of doubt, the growth requirements of the strain were tested in respect to X and V factors. The other bacteria, recognized by the colony and by smear, were as follows: staphylococci, diphtheroids, gram-negative cocci and nonhemolytic streptococci. Staphylococci were taken as one group, no differentiation being attempted. Gram-negative cocci were considered as one group also. The basic mediums consisted in a fresh beef heart infusion broth or agar adjusted to a p_H of 7.6. Neopeptone was used in all mediums and 5 per cent rabbit blood was added to make the blood agar plates, which were prepared each morning.

For the purpose of "control," additional material was collected by reviewing the routine cultures made on admission for children without infection admitted to the pediatric service of the New Haven Hospital during the last five winters.

RESULTS

Incidence of All Organisms.—The study covered the five months from November 1939 to March 1940, and a total of 629 cultures was examined. A summary of the organisms found in the cultures for children and for adults is given in table 1. The bacteria found in the

cultures for the children of the nursery were pneumococci (in 44 per cent), H. influenzae (in 26 per cent), hemolytic streptococci (in 5 per cent), gram-negative cocci (in 50 per cent), staphylococci (in 50 per cent), diphtheroids (in 30 per cent), nonhemolytic streptococci (in 4 per cent) and unclassified organisms (in 5 per cent). The incidence of the same organisms in the cultures of material from the nose for the 200 children without infection admitted to the pediatric ward of the New Haven Hospital was: pneumococci in 15 per cent, H. influenzae in 4 per cent, hemolytic streptococci in 2 per cent, gram-negative cocci in 5 per cent, staphylococci in 94 per cent, diphtheroids in 38 per cent, nonhemolytic streptococci in 1 per cent and unclassified organisms in 1 per cent. The carrier rates for potential pathogens, for example, pneumococci, H. influenzae and hemolytic streptococci, were definitely lower for the series from the hospital than for the series from the day nursery. Gram-negative cocci were in 5 per cent and staphylococci were in 94 per cent of the cultures made on admission for the children entering the hospital as compared with the incidence of 50 and 50 per cent, respectively, for the children in the nursery. Among the adults the carrier rates for pneumococci, H. influenzae and streptococci were much lower than among the children. The data given in table 1 are presented graphically in figure 1.

There was a similarity in the bacterial flora of the three groups of children in the nursery under 5 years of age (2 to 3, 3 to 4 and 4 to 5) and in those of the two groups over 5 years old (5 to 6 and 6 to 8). Accordingly, the data are presented in figure 2 in two main groups, namely, for the children who were 2 to 5 years old and for those 5 to 8 years old. Gram-negative cocci and pneumococci occurred more frequently than staphylococci and diphtheroids in the cultures for the children of 2 to 5 years, but the reverse was noted in those of the children 5 to 8 years old. In other words, the younger children harbored more of the potentially pathogenic organisms and gram-negative cocci and fewer staphylococci than the elder children did.

Pneumococci.—Of 275 strains of pneumococci obtained from the cultures of material from the noses of children in the nursery, 92 per cent could be typed. The following seventeen types were represented: I, III, IV, V, VI, IX, XI, XIII, XIV, XVI, XVII, XVIII, XIX, XX, XXII, XXIII and XXXI. The relative frequency of occurrence of the different types of pneumococci is given in table 2. Type VI was the commonest, being present at one time or another in the cultures for 24 of the 38 carriers of pneumococci. The next in order of frequency were types XIX, XXIII, XXII and IV. Type I was obtained in but 4 cultures, and these were for 2 subjects. Type III was obtained from cultures for a single patient on 3 occasions only. Type II was not found. These results are in accord with those obtained by Neufeld and Etinger-

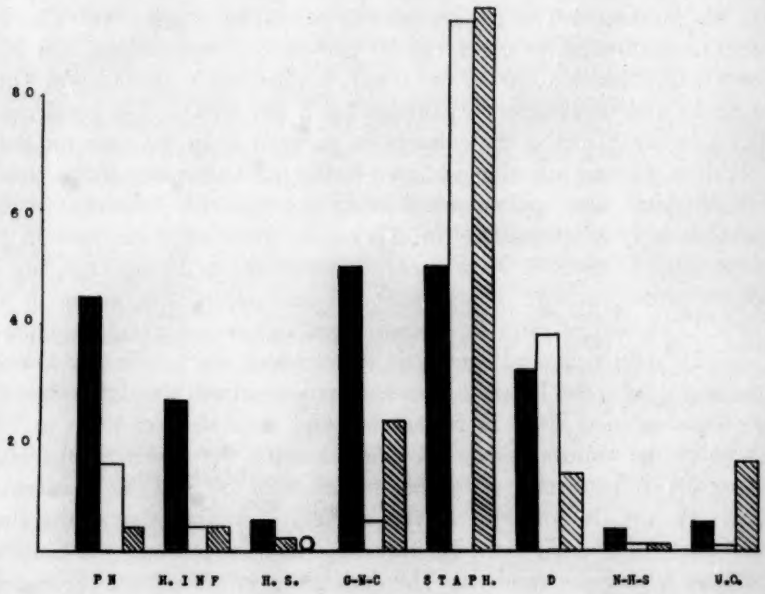

Fig. 1.—Percentage incidence of organisms in cultures of material from the nose for children (black columns) and adults (cross-hatched columns) in a day nursery and for children without infection (white columns) admitted to the hospital. In this figure and in figure 2, *PN* signifies pneumococci; *H. Inf.*, H. influenzae; *H.S*, hemolytic streptococci; *G-N-c*, gram-negative cocci; *Staph.*, staphylococci; *D*, diphtheroids; *N-H-S*, nonhemolytic streptococci; *U.O.*, unclassified organisms, and *O*, no hemolytic streptococci.

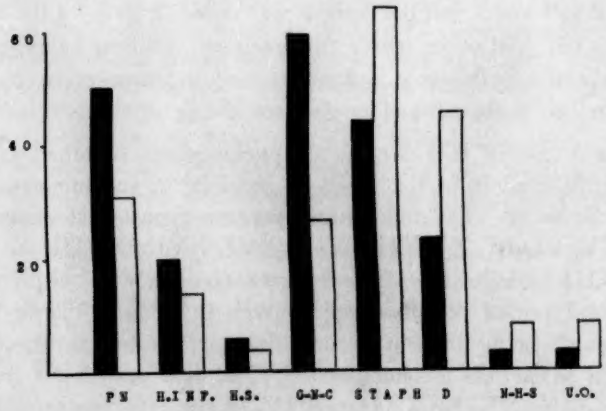

Fig. 2.—Percentage incidence of organisms in cultures of material from the nose for children in a day nursery who were 2 to 5 (black columns) and 5 to 8 (white columns) years old.

Zulzynska [8] and Andrew,[9] in New York and by Straker and her co-workers,[1h] in England. They found that types VI and XIX were present in a high proportion of the cultures for children without pneumonia and that they predominated in those for infants with colds and that type III was not as frequent in cultures for children as in those for adults.

TABLE 2.—*Incidence of Types of Pneumococci in Cultures of Material from the Nose for Forty Children in a Day Nursery*

Type of Pneumococcus	Number of Children	Percentage of All Children
I	2	5
III	1	3
IV	6	16
V	4	11
VI	24	63
IX	3	8
XI	4	11
XIII	1	3
XIV	4	11
XVI	4	11
XVII	1	3
XVIII	1	3
XIX	10	26
XX	2	5
XXII	9	24
XXIII	10	26
XXXI	1	3
Unclassified	12	34

TABLE 3.—*Number of Types of Pneumococci Found in Cultures for Thirty-Eight Children in a Day Nursery*

Children		Number of Types of Pneumococci Carried
Number	Percentage	
6	16	1
12	32	2
13	34	3
5	13	4
2	5	5

Of the 40 children in the nursery, 38 were carriers of pneumococci at some time or another. Six children carried one type; 12, two types; 13, three types; 5, four types, and 2, five types (table 3).

On no occasion was more than one type of pneumococcus recovered from a single culture, although certain variations in the form of the

8. Neufeld and Etinger-Tulzynska, cited by Bullowa, J. G. M., and Greenbaum, E.: Pneumococcic Pneumonia in Infants and Children, Am. J. Dis. Child. **53**: 22 (Jan.) 1937.

9. Andrew, E. T.: Lobar Pneumonia in Children, Am. J. Dis. Child. **54**: 1285 (Dec.) 1937.

pneumococcus on one plate were seen from time to time. Whenever this was observed, examples of the different forms were examined, but, as has been stated, only one type was ever identified in a single culture. Some children carried one type for a time, ceased to be carriers for a time and then began to carry the same type again or a new type. Some frequently changed the type carried, with no rest period. A few carried the same type all the time. Of the 38 carriers for whom data are given in table 3, 12 carried pneumococci for two to five months, 15 carried them periodically for two to four weeks and 11 carried them on scattered occasions.

Table 4 shows the types of pneumococci found in the weekly cultures for each child of room 1 (3 to 4 years old) and room 2 (4 to 5 years old) of the day nursery. In room 1, 8 children carried type VI and 3 carried type XXIII. In room 2, 7 children carried type VI, 4 carried type XXIII and 4 carried type XXII. Of 7 pairs of brothers or sisters in this series, 5 had the same type at some time. The types which were carried for the longest periods, in descending order of duration, were VI, XXII, XXIII and XIX.

H. Influenzae.—The carrier rate for H. influenzae was lower than that for pneumococci but was closely related to age. The younger children carried H. influenzae more frequently than the older ones. It is of interest to note that of 161 instances of identification of H. influenzae, in 99, or 62 per cent, pneumococci were also present. This is in agreement with a statement in the report of Straker and her co-workers, "A person who is harbouring one of those pathogenic organisms is subject to an increased chance of harbouring the other."

Hemolytic Streptococci.—The occurrence of streptococci was low in this series as compared with that of pneumococci and H. influenzae. When hemolytic streptococci were predominant in the culture, the subject usually had otitis media, sore throat or other definite illness. However, whether present in small numbers or in predominance, they seemed to have no relation to other pathogens.

Table 5 follows Webster's classification of carriers: transient carriers (persons found to harbor the organisms once or on scattered occasions), periodic carriers (persons found to harbor the organisms continuously for two to four weeks once in a while) and chronic carriers (persons found to harbor the organisms for more than two months). It is of interest to note that there were 12 chronic carriers of pneumococci and 6 of H. influenzae but none of hemolytic streptococci. There were 15 periodic carriers of pneumococci, 11 of H. influenzae and 2 of hemolytic streptococci. There were 11 transient carriers of pneumococci, 16 of H. influenzae and 14 of hemolytic streptococci. Finally, there were 2 noncarriers of pneumococci, 7 of H. influenzae and 24 of hemolytic streptococci. This may be stated in another way: Pneumococci were

TABLE 4.—*Results of Weekly Cultures* with Respect to Pneumococci for Children in a Day Nursery*

Room †	Child	November				December				January				February				March			
1	1	..	..	XVI	XVI	0	‡	V	V	VI	VI	0	VI	‡	VI	V	0	0	0	VI	VI
	2	..	..	..	..	..	..	XXIII	VI	‡	0	‡	VI	VI	VI	0	0	0	0	0	I
	3	..	..	‡	XXIII	XXIII	XXIII	‡	VI	V	VI	VI	VI	VI	VI	0	XIV	XIV	XIV	0	I
	4	..	VI	VI	VI	VI	U.C.	0	‡	VI	‡	‡	‡	0	0	0	0	0	XXII	XXII	0
	5	..	..	VI	VI	‡	VI	VI	‡	‡	‡	0	VI	VI	0	‡	VI	VI	VI	U.C.	0
	6	..	..	VI	IX	‡	VI	0	0	‡	‡	XXXI	XXXI	0	0	0	0	0	0	0	0
	7	..	..	0	0	‡	VI	0	0	0	‡	0	‡	I	0	0	I	I	0	0	0
	8	..	..	‡	XXIII	0	0	0	‡	0	0	‡	XXII	VI	0	‡	‡	‡	0	‡	‡
	9	..	..	‡	‡	‡	‡	‡	0	‡	0	‡	0	0	XIV	XIV	0	XIV	XIV	XIV	0
	10	..	..	..	U.C.	U.C.	U.C.	0	‡	‡	‡	U.C.	U.C.	0	0	‡	‡	‡	‡	‡	‡
2	11	..	..	..	VI	VI	0	0	‡	0	0	‡	XIX	XIX	XIX	XIX	0	0	0	0	XXIII
	12	..	VI	0	VI	0	XXIII	XXIII	‡	‡	‡	0	XXII	IV	IV	V	‡	0	IV	IV	IV
	13	VI	VI	VI	‡	VI	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII	XXII
	14	0	0	0	VI	0	VI	VI	VI	‡	‡	0	XXII	XXII	XXII	XXII	XXII	0	0	0	0
	15	0	0	0	VI	0	XXII	XXII	XXII	‡	0	XXII	XXII	0	‡	XXII	XXII	0	‡	‡	0
	16	..	0	0	0	0	0	XXIII	‡	0	‡	0	0	0	XXIII	‡	‡	0	‡	‡	‡
	17	0	0	XXIII	XXIII	XXIII	XXIII	XXIII	XXIII	0	0	XI	XI	XI	‡	XI	XI	0	0	0	0
	18	0	0	U.C.	0	0	IX	0	‡	‡	‡	0	0	0	VI	0	0	XIX	‡	IV	‡
	19	..	..	..	0	IX	0	0	0	0	0	0	0	0	0	VI	III	0	III	III	0

* The symbol 0 signifies no pneumococci were found; U.C. signifies the pneumococcus found was unclassified.

† Of the children in room 1 (3 to 4 years old), 8 carried type VI and 3 carried type XXIII. Of those in room 2 (4 to 5 years old), 7 carried type VI, 4 carried type XXIII and 4 type XXII.

‡ No culture was done.

the commonest organisms carried by the children, H. influenzae was next in frequency and hemolytic streptococci were rarely carried by the children of the day nursery.

CLINICAL OBSERVATIONS

There was no epidemic of serious infectious disease in the day nursery during the period of observation. One child had chickenpox, but no

TABLE 5.—*Classification of Carriers of Pneumococci H. Influenzae and Hemolytic Streptococci Among Forty Children in a Day Nursery*

	Noncarrier	Transient Carrier	Periodic Carrier	Chronic Carrier
Of pneumococci				
Among 26 children 2-4 years old	0	7	8	11
Among 14 children 5-8 years old	2	4	7	1
Total	2	11	15	12
Per cent	5	27.5	37.5	30
Of H. influenzae				
Among 26 children 2-4 years old	3	10	7	6
Among 14 children 5-8 years old	4	6	4	0
Total	7	16	11	6
Per cent	17.5	40	27.5	15
Of hemolytic streptococci				
Among 26 children 2-4 years old	15	9	2	0
Among 14 children 5-8 years old	9	5	0	0
Total	24	14	2	0
Per cent	60	35	5	0

TABLE 6.—*Incidence of Organisms in Cultures of Material from the Nose for Five Children With and Without Colds*

	Number of Cultures	Percentage Incidence				
		Pneumococci	H. Influenzae	Staphylococci	Gram-Negative Cocci	Diphtheroids
For children* with common cold	33	42	9	58	30	15
For children* without colds	66	12 †	0	80	32	21

* The children were members of two physicians' families.
† All these pneumococci were in the cultures for 1 child, who has asthma and hay fever.

further case occurred, and 1 child had type XIX lobar pneumonia. The chief infection was the common cold, or grip. With the onset of any illness, the children were kept away from the nursery. Accordingly, observations were made chiefly during convalescence and the period of so-called normal health.

For four months observations were made on two physicians' families, which included 5 children and 2 adults. An average of 17 nasal cultures were obtained for each subject. Each one had two to four attacks of the common cold. The nasal floras of the 5 children during colds and during normal periods are compared in table 6. Pneumococci were

definitely predominant and occurred only during colds in the cultures for 3 children; pneumococci never appeared in the cultures for 1 child even during colds and pneumococcus XVIII was always present in the cultures for the fifth child, who had attacks of bronchial asthma frequently. In general, the predominance of pneumococci became especially noticeable with the occurrence of nasal discharge. For adults who had colds no pneumococci were found in the cultures of material from the nose, but H. influenzae was present in them on 3 occasions.

COMMENT

The few varieties of bacteria constituting the nasal flora and the change in the constituents of the flora with age made it possible to follow in a group of children the ebb and flow of the common bacterial pathogens of the respiratory tract. On many occasions during infections of the respiratory tract, potentially pathogenic bacteria appeared in great profusion and even in almost pure culture, as has been described by others.[10]

Thirty-eight of the 40 children in the nursery were carriers of pneumococci at one time or another, 11 were transient carriers, 15 were periodic carriers and 12 were chronic carriers. These figues are somewhat higher than those usually reported. This may be due to the number of younger children included in the study. According to these results, the younger children in the nursery harbored more pathogens than did the older children.

The types of pneumococci found commonly in the series were VI, XIX, XXII and XXIII, the types generally associated with the occurrence of colds and bronchopneumonia. The parasitic types, which are frequently found in cases of lobar pneumonia in adults and children above 2 years of age, were rare in this series. Strangely enough, type III, the type usually carried by adults, was rare in the nursery. Type II was not found.

Among the control subjects (physicians' families and the hospitalized children) there were a few carriers of pneumococci.

After pneumococcus, H. influenzae was the next most common potential pathogen found. It was associated with pneumococci in about 62 per cent of the cultures. Hemolytic streptococci rarely appeared in the cultures, and when they did they were usually associated with illness of the subject.

In another year or under other circumstances, a different nasal flora might be anticipated. The simplicity of the method used to study the

10. Webster and Hughes.[1d] Straker, Hill and Lovell.[1h] Hodes, Stifler, Walker, McCarty and Shirley.[4] Auger.[5] Poole and Fousek.[6] Andrew.[9]

bacterial flora of the nose and the frequency with which potential pathogens were found offer something for the epidemiologic study of disease of the respiratory tract in young children.

The results of the present study may be of value as control material when cultures of material from the nose are used in the diagnosis of lobar pneumonia or in the clinical evaluation of the nasal bacteria during acute infection of the respiratory tract in children. The results indicate that the type of pneumococcus in the nose must be considered in relation to the clinical data and the epidemiologic background of the child.

The board of directors and the staff of the Leila Day Nursery furnished most of the clinical material for this study.

EFFECT OF IRRADIATION OF THE AIR IN A WARD ON THE INCIDENCE OF INFECTIONS OF THE RESPIRATORY TRACT

WITH A NOTE ON VARICELLA

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In a recent communication [1] it was shown that the incidence of infections of the upper respiratory tract in a ward was decreased by means of indirect ultraviolet irradiation of the air.

Encouraged by the results of this study, we resumed our observations on a new group of infants and studied the effect of continuous, instead of interrupted, irradiation of the air. As stated in our previous communication, we had hoped by means of intensified treatment to reduce further the incidence of ward infections. This investigation was begun in October 1939 and terminated April 30, 1940. The method of procedure during this period was identical with that used in the previous study except for continuous operation as against the interrupted irradiation employed in the earlier investigation.

During the 1939-1940 period, in the group of 15 infants placed in the irradiated ward 59 infections occurred, whereas among the 19 control infants 101 infections occurred. The data in the table reveal that in the experimental group the average number of infections per infant was 3.9, as against 5.3 infections per infant in the control group. The chi square test applied to these results gave a value of 0.056 for P,[2] which does not indicate a high degree of probability. Comparison of these results with those of the previous years made it evident that our efforts at further reduction of the incidence of infections of the upper respira-

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From the Home for Hebrew Infants.

1. Barenberg, L. H.; Greene, D., and Greenspan, L.: Effect of Irradiation of the Air in a Ward on the Incidence of Infections of the Respiratory Tract, Am. J. Dis. Child. **59**:1219 (June) 1940.

2. P is a measure of the extent to which the differential in the relative frequency of infections between the control and the experimental group may occur by chance. When P is less than 0.05 the differential between the control and the experimental group is much greater than can be ascribed to chance alone.

tory tract had not been realized. An explanation was obtained when a check of the efficiency of the lamps at the end of the study revealed a reduction of about 30 per cent in the output of ultraviolet rays.

An interesting sidelight of this investigation came to the fore when an epidemic of varicella occurred while the study was in progress. McKhann and his associates [3] had previously observed a reduction in the number of cross infections with varicella when an ultraviolet light

Comparison of the Incidence and Severity of Infections of the Upper Part of the Respiratory Tract in Two Groups of Children During Five Winter Seasons (1935-1940)

Date	Ward	Number of Children	Average Age at Beginning of Study, Mo.	Average Period of Observation, Mo.	Infections						
					Total Number	Very Mild	Mild	Moderate	Severe	Percentage of Moderate and Severe	Per Child per Month
10/14/35 to 4/18/36	1	22	10.4	4.7	60	41	12	3	4	11.6	0.57
10/14/35 to 4/18/36	5	21	11.6	4.0	43	31	5	7	0	16.3	0.51
10/14/36 to 4/18/37	1	18	10.4	4.6	58	43	9	5	1	10.3	0.7
10/14/36 to 4/18/37	5	19	12.0	4.6	56	43	8	5	0	9.0	0.64
1/ 5/38 to 5/31/38	1*	18	8.5	4.87	37	24	10	2	1	8.1	0.42
1/ 5/38 to 5/31/38	5	19	8.1	4.9	73	45	14	9	5	19.1	0.77
10/14/38 to 4/18/39	1*	17	9.0	5.6	56	38	13	4	1	8.9	0.59
10/14/38 to 4/18/39	5	20	10.5	5.6	93	61	20	11	1	12.9	0.78
10/16/39 to 4/30/40	1*	15	8.7	6.5	59	29	18	8	4	20.0	0.62
10/16/39 to 4/30/40	5	19	10.0	6.5	101	57	29	9	6	15.0	0.85

* Ward in which the air was irradiated by ultraviolet rays.

barrier was used. Utilizing ultraviolet light in schoolrooms, Wells [4] noted a marked decrease in secondary cases during an epidemic of chickenpox. In our institution there were 165 cases of this disease in a population of 170 infants and children (in the main building), exclusive of those infants in the irradiated ward, or an incidence of 97 per cent. In the control ward, varicella developed in 18 of 19 infants. On the other hand, not a single case occurred in the irradiated ward, even

3. McKhann, C. F.; Steeger, A., and Long, A. P.: Hospital Infections: Survey of the Problem, Am. J. Dis. Child. **55**:579 (March) 1938.

4. Wells, W. F.: Personal communication to the authors.

though this ward shared the services of the night nurse who cared for the children in an adjoining ward where the incidence of the disease was 100 per cent.

From our experience during the past three winter seasons with the use of ultraviolet irradiation of the air, we are convinced that this method holds much promise in reducing the incidence of infections of the upper respiratory tract. There are still many obstacles to hurdle before excellent results can be claimed for this method. Some of these obstacles are connected with better ventilation and with the source of light. During the colder months of the year, when windows are either closed or only partially opened, not many changes of air per hour occur in the ward. Under such conditions, the air close to the lamps may be sterilized, but that which is farther away will be only slightly affected by the indirect irradiation. It is obvious that a source of light is needed which will sterilize the air over a wider area than is now possible with indirect irradiation. It is possible that such an effect may be obtained by direct irradiation.

Mr. M. Spiegelman, of the statistical bureau of the Metropolitan Life Insurance Company, gave assistance in the statistical compilations.

THE BODY BUILD ASPECT OF IMMUNITY TO DIPHTHERIA

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The anthropometric studies that have been made in various diseases, such as tuberculosis,[1] allergy and poliomyelitis,[2] may be considered an indirect approach toward correlating body build with susceptibility and resistance to disease. However, not until there was some means of measuring an immune substance could immunity be subjected to anthropometric studies and the results of these studies, in turn, correlated with body build.

The diphtheria antitoxin in human serum is at present the only readily measurable immune substance. The antitoxin does not occur in measurable amounts in the blood of most children unless, or until, its production is stimulated by administration of diphtheria toxin or toxoid. A study of the antitoxin response to such stimulation has been previously reported in one cross section of the child population.[3] The diphtheria antitoxin content of the blood serum was determined by the method of Jensen.[4] The distribution of the children thus studied according to the antitoxin content of the serum was plotted in a typical frequency curve. The antitoxin content of the serum, expressed as the number of units of antitoxin per cubic centimeter, can be divided into five groups in multiples of ten, as follows:

Group		Units
1	.....	0 to 0.005
2	.....	0.006 to 0.05
3	.....	0.06 to 0.50
4	.....	0.6 to 5.0
5	.....	6.0 to 50.0

1. Pryor, H. B., and Mathiasen, H.: An Anthropometric Study of Tuberculous Children, Am. Rev. Tuberc. **33**:348 (March) 1936.

2. Thelander, H. E., and Pryor, H. B.: Anthropometric and Anthroposcopic Studies of Poliomyelitis, Arch. Pediat. **50**:749 (Nov.) 1933.

3. Thelander, H. E.: Diphtheria Immunity and Frequency Distribution Curves for Antitoxin, Am. J. Dis. Child. **59**:342 (Feb.) 1940.

4. Jensen, C.: Die intrakutane Kaninchenmethode zur Auswertung von Diphtherie-Toxin und Antitoxin, Acta path. et microbiol. Scandinav., 1933, supp. 14, p. 1.

Such a division includes practically the entire range of antitoxin values as found in human beings, since it is extremely rare for a person to have more than 50 units of antitoxin per cubic centimeter in the circulating blood.

The table shows the age-sex distribution of 91 recently immunized children from the clinic of the Hospital for Children, San Francisco, arranged by antitoxin groups. There were 43 boys and 48 girls. No sex difference is evident. In general, the older children tend to have more

Age-Sex Distribution by Antitoxin Groups of Ninety-One Recently Immunized Children

	Group 1		Group 2		Group 3		Group 4		Group 5		
Age, Yr.	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Total
Up to 2	..	..	..	1	4	1	..	..	..	..	6
3 to 4	2	3	6	9	9	12	2	7	..	..	50
5 to 6	1	..	5	1	4	4	1	2	..	..	18
7 to 8	1	..	1	1	3	..	1	1	1	..	9
9 to 10	..	..	..	1	..	2	1	..	..	..	4
11 to 12	..	..	..	1	..	1	1	1	..	..	4
Total	4	3	12	14	20	20	6	11	1	..	91

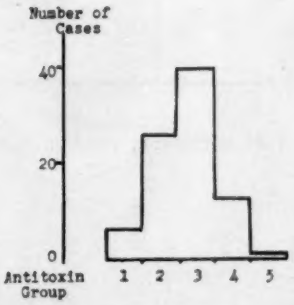

Chart 1.—Distribution of 84 immunized children according to diphtheria antitoxin group. Group 1 had less than 0.005 units per hundred cubic centimeters of serum; group 2, from 0.006 to 0.05 units; group 3 from 0.06 to 0.5 units; group 4 from 0.6 to 5.0 units and group 5, from 6.0 to 50.0 units.

units of antitoxin than the younger ones, probably because more children in this older group had previously received toxoid, even though they had positive Schick reactions or gave no history of previous immunization.

Of the children immunized and tested for the antitoxin content of the blood serum, we were able to get complete body measurements of 84. The distribution of these children according to antitoxin content is shown graphically in chart 1. This chart follows roughly the form of a normal distribution curve, with more than the expected number of cases falling into antitoxin group 2. The majority of these children had had only two doses of toxoid, but as a result of these observations, the routine

at the clinic has been changed so that the children receive three doses of 1 cc. each, three to four weeks apart.

Anthropometric measurements were used to classify the children into body build groups. The width-length index, as described elsewhere,[5] was the basis of classification into slender, intermediate and broad build groups. These indexes identified children who were 1 standard deviation or more above average as broad built and those who were 1 standard deviation or more below average as slender built. There were 13 children in the slender-built group and 15 in the broad-built group.

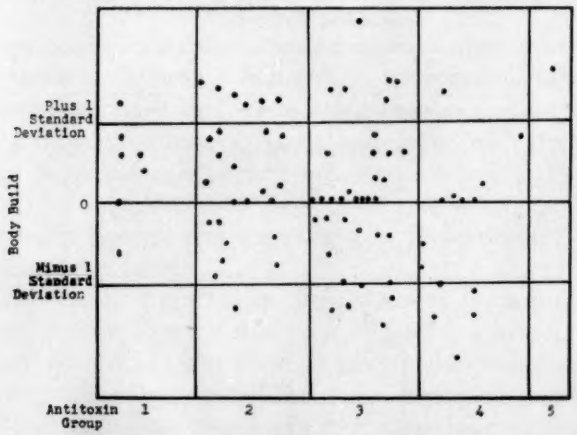

Chart 2.—Distribution of 84 immunized children according to body build and diphtheria antitoxin group.

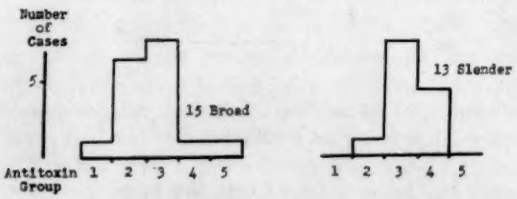

Chart 3.—Distribution of 15 broad-built and 13 slender-built recently immunized children according to diphtheria antitoxin group.

The scattergram (chart 2) shows the distribution of the 84 children by body build and by antitoxin group. It will be seen that broad children tend to have fewer units of antitoxin than slender ones. However, the 1 child in group 5 who had 8 units of antitoxin per hundred cubic centimeters of serum was a broad-built boy, an exception to this rule. Also, all of the body build groups are represented in all of the first four

5. Pryor, H. B.: Width-Weight Tables, Stanford University, Calif., Stanford University Press, February 1936.

antitoxin groups. However, there were more children with a high number of units in the slender-built group and fewer with a high number of units in the broad-built group.

The Pearson correlation calculated from the scattergram yields a coefficient of -0.378 ± 0.032. There is, then, in this series a small negative relation between the relative body width and the response to immunization in units of antitoxin.

Chart 3 is a graphic distribution according to antitoxin content of the 15 broad-built and the 13 slender-built children. It shows that all but 2 of the broad-built children fall into antitoxin group 1, 2 and 3, while all but 1 of the slender-built children fall into groups 3 and 4, the single exception being in group 2.

CONCLUSIONS

Measurement of the diphtheria antitoxin content of human serum offers the opportunity of correlating immunity to diphtheria with body build.

The distribution of immunity to diphtheria by age and sex in this series shows higher immunity for older children than for younger ones, with no sex differences.

Broad-built children in this series had fewer units of antitoxin than slender-built ones.

The correlation between relative width of the body and units of antitoxin present after immunization was -0.378 ± 0.032 for the series of 84 children.

SO-CALLED ESSENTIAL HYPERTENSION IN CHILDHOOD

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Slightly less than 100 cases of essential hypertension among children have been reported in the literature.[1] This seems a surprisingly small number when it is recalled that over half a million adults die each year in the United States of cardiovascular-renal disease, one half of them as a direct result of high blood pressure. A comparison of these two sets of figures would imply that essential hypertension has no connection with childhood and that it mysteriously springs up in later adult life without any previous background. The facts, however, that

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From the Abraham Jacobi Division for Children, Lenox Hill Hospital; Service of Dr. Jerome S. Leopold.

1. (*a*) Barlow, W. H.: A Case of Granular Contracted Kidney (Cirrhosis of Kidney) in a Child of Five Years and Eleven Months, Lancet **2**:150-153 and 190-193, 1874. (*b*) Schwarz, H.: Malignant Hypertension Nephritis: Primary Sclerotic Kidney (Schrumpfniere), Am. J. Dis. Child. **27**:233-242 (March) 1924. (*c*) Bell, E. T., and Clawson, B. J.: Primary (Essential) Hypertension, Arch. Path. **5**:939-1002 (June) 1928. (*d*) Keith, N. M.; Wagener, H. P., and Kernohan, J. W.: The Syndrome of Malignant Hypertension, Arch. Int. Med. **41**:141-188 (Feb.) 1928. (*e*) Amberg, S.: Hypertension in the Young, Am. J. Dis. Child. **37**:335-350 (Feb.) 1929. (*f*) Comby, J.: L'hypertension artérielle dans l'enfance, Arch. de méd. d. enf. **32**:608-618 (Oct.) 1929. (*g*) Färber, E.: Zur Frage der chronischen Blutdrucksteigerung im Kindesalter, Monatschr. f. Kinderh. **42**:148-156, 1929. (*h*) Holzmann, E.: Essentielle Hypertension im frühen Kindesalter, ibid. **45**:449-452, 1929. (*i*) Meyer, E.: Blutdruckuntersuchungen am gesunden und kranken Kindern, Ztschr. f. Kinderh. **47**:560-580, 1929. (*j*) Hutchinson, R., and Moncrieff, A.: A Case of Primary Hypertension in a Child, Brit. J. Child. Dis. **27**:201-204 (July-Sept.) 1930. (*k*) Murphy, F. D., and Grill, J.: So-Called Malignant Hypertension: A Clinical and Morphologic Study, Arch. Int. Med. **46**:75-104 (July) 1930. (*l*) Siegel, A. E., and Thomas, P. C.: Primary Hypertension in Childhood: The Influence of Hyperadrenalinism, Arch. Pediat. **47**:473-481 (Aug.) 1930. (*m*) Craig, J.: Malignant Hypertension in Childhood, Arch. Dis. Childhood **6**:157-164 (June) 1931. (*n*) Klein, M.: Schrumpfnieren im Kindesalter, Frankfurt. Ztschr. f. Path. **41**:317-331, 1931. (*o*) Klemperer, P., and Otani, S.: "Malignant Nephrosclerosis" (Fahr), Arch. Path. **11**:60-117 (Jan.) 1931. (*p*) Doxiades, L.: Hypertonie und Hypotonie im Kindesalter, Ztschr. f. Kinderh. **53**:366-385, 1932. (*q*) Hoyle, C.: Adolescent Hypertension, with Excretion of an Adrenaline-Like Substance in the Urine, Lancet **2**:230-233 (July 29) 1933. (*r*) Macciotta, G.: Considerazioni su una manifestazione episodica di ipertensione arteriosa essenziale in un bambino di sei anni, Pediatria **41**:297-313

hypertension is common in young adults [2] and that heredity is the most important collateral etiologic factor [3] should immediately cast serious doubts on these implications. The paucity of articles on essential hypertension in pediatric periodicals and textbooks indicates a curious lack of interest on the part of pediatricians in a condition which kills more than twice as many people as cancer and about which much has been learned in the past eight years. It would therefore appear to be of value to report 7 cases of so-called essential hypertension which have been studied at the Abraham Jacobi Division for Children and to discuss the newer concepts of this disease, especially from the pediatric point of view.

Fishberg [4] defined essential hypertension as chronically elevated blood pressure which has not evolved from antecedent inflammatory disease of the kidneys or urinary obstruction. The definition will be further narrowed in this paper to exclude such obvious causes of hypertension as adrenal cortical carcinoma, pituitary basophilism, hyperthyroidism, rheumatic fever [5] and increased intracranial pressure. Essential hypertension will be regarded as renal but not as nephritic hypertension.

(March) 1933. (*s*) Liebenam, L.: Beitrag zum Krankheitsbild der essentiellen Hypertension im Kindesalter, Monatschr. f. Kinderh. **63**:171-184, 1935. (*t*) Taussig, H. B., and Remsen, D. B.: Essential Hypertension in a Boy of Two Years of Age, Bull. Johns Hopkins Hosp. **57**:183-192 (Oct.) 1935. (*u*) Nobécourt, P.: Sur deux filles de 15 mois et de 3 ans 11 mois présentant de L'hypertension artérielle permanente sans symptômes de néphrite chronique, Progrès méd., Feb. 15, 1936, pp. 221-235. (*v*) Frölich, K.: Jugendliche Zwillinge mit arteriellen Hochdruck, Med. Klin. **33**:1196-1199 (Sept. 3) 1937. (*w*) Räihä, C. E.: Ueber im Kindesalter ohne Nierensymptome und neben Nierensymptomen vorkommenden hohen Blutdruck, Acta pædiat. **21**:336-361, 1937. (*x*) Gadrat, J., and Fournier, W.: Hypertension essentielle chez l'enfant, Arch. de méd. d. enf. **42**:257-270 (May) 1939. (*y*) Clark, H. C.: Hypertension in Early Childhood, Am. J. Dis. Child. **59**:353-361 (Feb.) 1940.

2. Robinson, S. C., and Brucer, M.: Range of Normal Blood Pressure: A Statistical and Clinical Study of 11,383 Persons, Arch. Int. Med. **64**:409-444 (Sept.) 1939.

3. (*a*) Glomset, D. J.: Hereditary Hypertension, J. Iowa M. Soc. **21**:220-222 (May) 1931. (*b*) Ayman, D.: The Hereditary Aspects of Arteriolar (Essential) Hypertension: Study of Three Generations of a Family, New England J. Med. **209**:194-197 (July 27) 1933; (*c*) Heredity in Arteriolar (Essential) Hypertension: A Clinical Study of the Blood Pressure of 1,524 Members of Two Hundred and Seventy-Seven Families, Arch. Int. Med. **53**:792-802 (May) 1934. (*d*) Hines, E. A., Jr.: The Hereditary Factor in Essential Hypertension, Ann. Int. Med. **11**:593-601 (Oct.) 1937.

4. Fishberg, A. M.: Hypertension and Nephritis, ed. 4, Philadelphia, Lea & Febiger, 1939.

5. Taussig, H. B., and Hecht, M. S.: Studies Concerning Hypertension in Childhood: I. The Development of Essential Hypertension Under Observation, Bull. Johns Hopkins Hosp. **62**:482-521 (May) 1938.

This modified definition stems from the pioneer, now classic, work of Goldblatt,[6] who produced persistent hypertension in dogs and monkeys by occluding the main renal arteries with silver clamps. Even before these experiments had been performed it was recognized that sclerotic narrowing of the intrarenal arteries and arterioles was to be found at necropsy in 97 to 100 per cent of patients with essential hypertension.[7] In a recent, carefully controlled pathologic study of 50 cases of this disease,[8] marked atheromatous occlusion of the main renal arteries close to their origin from the aorta was found in 86 per cent. In other words, the diminution of renal blood flow produced experimentally by the Cleveland investigator [6] through the use of silver clamps is accomplished by nature by means of atheroma and connective tissue. The experimental and pathologic data indicate, at present, that reduction of renal blood flow is the main initiating etiologic factor in the production of so-called essential hypertension.

A report of 7 cases of so-called essential hypertension in childhood follows.

REPORT OF CASES

CASE 1.—The patient was born Dec. 2, 1926. There had been a somewhat difficult instrumental delivery, lasting seventy-two hours, but the infant had not become cyanotic or stuporous nor had any convulsions, twitchings or other signs of intracranial injury developed. The family history was irrelevant. This was the mother's first pregnancy, and it had been uneventful. The birth weight was 7 pounds 4 ounces (3,289 Gm.). The mother did not nurse the baby.

First Admission.—The patient was first admitted to the hospital on Feb. 17, 1927, at the age of 9 weeks, because of mild diarrhea. She was a normal infant, weighing 8 pounds 14 ounces (4,026 Gm.), and her physical examination gave essentially normal results. The results of urinalysis were negative.

Second Admission.—She returned to the hospital ten days later because of bilateral purulent otitis media and recurrence of the diarrhea. Bilateral myringotomy was performed.

Third Admission.—The third admission was on May 14, 1929, when she was 2 years old. Her first tooth had appeared at 8 months. She had sat up at 8 months, walked at 16 months and talked at 18 months. She had suffered from many colds and attacks of sore throat in the past year and a half.

Results of the physical examination were normal except for the presence of enlarged, cryptic tonsils, which were removed, with the adenoids. Results of urinalysis were negative.

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6. Goldblatt, H.: Experimental Hypertension Induced by Renal Ischemia: Harvey Lecture, Bull. New York Acad. Med. **14**:523-553 (Sept.) 1938.

7. Fishberg, A. M.: Anatomic Findings in Essential Hypertension, Arch. Int. Med. **35**:650-668 (May) 1925. Moritz, A. R., and Oldt, M. R.: Arteriolar Sclerosis in Hypertensive and Non-Hypertensive Individuals, Am. J. Path. **13**: 679-728 (Sept.) 1937. Bell and Clawson.[1e]

8. Blackman, S. S., Jr.: Arteriosclerosis and Partial Obstruction of the Main Renal Arteries in Association with "Essential" Hypertension in Man, Bull. Johns Hopkins Hosp. **65**:353-375 (Nov.) 1939.

Fourth Admission.—Her next admission was on Nov. 11, 1930 when she was almost 5 years old. Six days previously she had begun to see double and had stumbled frequently. Her mother noticed that her left eye had turned inward. There had been no fever, headache, vomiting, diarrhea or symptoms referable to the upper respiratory tract. Four days previously she had been examined by an ophthalmologist, who detected some paresis of the left external rectus muscle. Her weight on admission was 57 pounds (25.9 Kg.), her height 45 inches (114 cm.). Normal weight for her age and height was 45 pounds (20.4 Kg.). She was afebrile. There were slight residual weakness of the left sixth nerve and some nystagmus on looking to the left. Otherwise, results of the physical examination were essentially normal.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 15.4 Gm. per hundred cubic centimeters; leukocytes 9,000 per cubic millimeter; polymorphonuclears 55 per cent, of which 8 per cent were immature forms; lymphocytes 38 per cent; eosinophils 2 per cent, and monocytes 5 per cent. The Wassermann reaction both of the patient and of the mother was negative. Roentgenograms of the skull and mastoid region were normal. The von Pirquet reaction was negative. Examination of the spinal fluid showed no globulin, chlorides 707 mg. and sugar 62 mg. per hundred cubic centimeters, and 10 cells per cubic millimeter, all of which were lymphocytes. The results of urinalysis were negative except for a faint trace of albumin.

Fifth Admission.—The patient returned to the hospital Dec. 4, 1931 because of fever and pain in the extremities and back for four days. The eyes were normal. A soft, systolic, localized apical murmur was heard. Otherwise, results of the physical examination were normal. An electrocardiogram was normal except for a PR interval of 0.2. This dropped to 0.15 in a week. The results of urinalysis were negative except for a faint trace of albumin. The temperature was 102.4 F. on admission and fell to normal in five days.

Sixth Admission.—The sixth admission was on June 21, 1933. The patient had had spontaneous ecchymoses over the crest of the ilium and on the right thigh for ten days. The apical systolic murmur was still present. With the exception of this and the ecchymotic areas, the physical examination gave normal results. Her weight was 63 pounds (28.6 Kg.), and her height was 50¾ inches (129 cm.). Normal weight for her age and height was 59 pounds (26.8 Kg.).

Laboratory Data: The blood count was: hemoglobin content (Sahli) 72 per cent; erythrocytes 4,200,100 and leukocytes 10,700 per cubic millimeter; polymorphonuclears 62 per cent, of which 15 per cent were immature forms; lymphocytes 35 per cent; monocytes 2 per cent, and eosinophils 1 per cent. Sedimentation rate (Cutler method) was 3 mm. in thirty minutes and 6 mm. in one hour. The bleeding time was four minutes, the clotting time, three minutes. In a fragility test of the red blood cells hemolysis began at a concentration of sodium chloride of 0.4 per cent and was complete at a concentration of 0.3 per cent.

Seventh Admission.—The seventh admission was on Oct. 14, 1936, when she was 9 years and 10 months of age. During the past three years she had had three episodes of fever with slight pain in joints and muscles, lasting from four to six weeks. There had been no objective arthritic manifestations. She had been well for fourteen months. The only other complaint was nocturnal enuresis for one year. The patient had grown rapidly, was markedly overdeveloped and weighed 102 pounds (46.3 Kg.). Physical examination revealed no abnormalities other than the systolic murmur. Results of numerous examinations of the fundi were negative.

Blood Pressure: Determinations of the blood pressure were made for the first time. The systolic pressure varied between 188 and 195 mm. of mercury and the diastolic pressure between 90 and 120 mm.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 13.9 Gm. per hundred cubic centimeters; erythrocytes 4,770,000 and leukocytes 8,550 per cubic millimeter; polymorphonuclears 64 per cent, of which 14 per cent were immature forms, and lymphocytes 36 per cent. Results of chemical determinations on the blood were: serum protein 7.5 Gm. per hundred cubic centimeters, albumin 4.8 Gm., globulin 2.7 Gm., serum cholesterol 184 mg., urea nitrogen 8.4 mg., creatinine 0.4 mg., uric acid 2.4 mg. and sugar 80 mg. The carbon dioxide–combining power of the blood was 47 volumes per cent. The basal metabolic rate was —9 per cent. Teleroentgenograms of the heart and lungs were normal. Roentgenograms of the bones were normal. An intravenous urogram was normal. Results of repeated urinalyses were negative except for an occasional faint trace of albumin. The urinary excretion of phenolsulfonphthalein was 65 per cent in two hours. The Fishberg concentration test gave a maximum specific gravity of 1.026. The sedimentation rate was 9 mm. in one hour.

Eighth Admission.—The patient was admitted for the eighth time on July 16, 1937, at the age of 10½ years. Her first menstrual period had occurred two months previously and had lasted five days. Her second, one month previously, had lasted four days and her third, in July, had likewise lasted four days. Her height was 5 feet 2 inches (157 cm.) and her weight 113 pounds (51.3 Kg.). Her physical appearance was that of a maturity far in advance of her chronologic age. She had large, well developed breasts, with areolas which were extensive and pigmented. The nipples were likewise prominent and well developed. She had profuse axillary and pubic hair, the latter being in the feminine distribution. The hips and bodily configuration were those of a young woman. Results of repeated examinations of the fundi were negative. The results of the rest of the physical examination were the same as on the last admission.

Blood Pressure: Readings were: right arm, systolic 165 mm. and diastolic 105 mm.; right leg, systolic 165 mm. and diastolic 110 mm.; left leg, systolic 160 mm. and diastolic 110 mm.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 102 per cent; erythrocytes 4,120,000 and leukocytes 8,100 per cubic millimeter; polymorphonuclears 57 per cent, of which 14 per cent were immature forms; lymphocytes 41 per cent; monocytes 1 per cent, and eosinophils 1 per cent. The electrocardiogram was normal. The basal metabolic rate was —9 per cent. Roentgenograms of the skull and abdomen were normal, as were the teleroentgenograms of the heart and lungs. Repeated examination of the urine gave negative results except for an occasional slight trace of albumin. The result of the urinary phenolsulfonphthalein test was an excretion of 73 per cent in two hours. The Fishberg concentration test gave a maximum specific gravity of 1.020. The wheal from the McClure-Aldrich test disappeared in forty-five minutes. A dextrose tolerance test showed that the concentration of blood sugar before the oral administration of 50 Gm. of dextrose was 79 mg. per hundred cubic centimeters; forty-five minutes after the concentration it was 107 mg. and two hours after it was 99 mg.

Ninth Admission.—Her ninth admission to the hospital was on Oct. 25, 1937, and she remained there until April 6, 1938. She had never complained of chronic headache, dyspnea, orthopnea, precordial pain, fatigue, vomiting or abdominal pain. She entered the hospital purely for study of the hypertension.

Her weight was 118 pounds (53.5 Kg.); her temperature was normal. All who examined her were impressed by her size, overdevelopment and sexual maturity. The results of the physical examination were the same as on the last admission. Numerous examinations of the fundi gave negative results except for some slightly increased density of the arteries.

Blood Pressure: The readings were: right arm, systolic 194 mm. and diastolic 112 mm.; left arm, systolic 196 mm. and diastolic 114 mm.; right leg (standing), systolic 260 mm. and diastolic 160 mm.; left leg systolic 260 mm. and diastolic 164 mm. The blood pressure remained fairly constant. The highest reading, when taken in the arm, was 210 systolic and 114 diastolic.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 15.6 Gm. per hundred cubic centimeters; erythrocytes 5,300,000 and leukocytes 12,000 per cubic millimeter; polymorphonuclears 50 per cent, of which 9 per cent were immature forms; lymphocytes 42 per cent; monocytes 5 per cent, and eosinophils 3 per cent. Results of chemical determinations on the blood were: serum protein 8 Gm. per hundred cubic centimeters, albumin 5.3 Gm., globulin 2.7 Gm., blood urea nitrogen 13 mg., creatinine 0.5 mg., uric acid 2.9 mg., sugar 100 mg. and serum cholesterol 200 mg. The carbon dioxide–combining power of the blood was 48 volumes per cent. The results of repeated urinalyses were all negative except for an occasional faint trace of albumin. An Addis count on a twelve hour specimen of urine (375 cc.) gave the following results: casts none; leukocytes 764,217; erythrocytes 35,000. The Fishberg concentration test gave a maximum specific gravity of 1.025. Cystoscopic examination gave normal results, the indigo carmine appearing from both ureters in three minutes. Cultures of urine from both ureters were sterile. A retrograde pyelogram was normal. Perirenal insufflation on both sides gave normal findings. The wheal from the McClure-Aldrich test disappeared in forty-six minutes. The reaction to an intradermal tuberculin test (0.1 mg.) was negative. Vaginal smears were negative for the gonococcus. Determinations of the metabolic rate over a five and a half month period were: -8, $+2$, 0, $+2$, $+3$, $+2$ and $+1$ per cent.

Therapy: The patient was placed on a 1,000 calory diet with up to 9 grains (0.58 Gm.) of desiccated thyroid U. S. P. daily but lost only 4 pounds (1,814 Gm.) during her stay in the hospital. Although she remained in bed for four months and received phenobarbital U. S. P., her blood pressure did not fall. An ounce (29.6 cc.) of 50 per cent solution of magnesium sulfate was administered daily for one week, with no effect on the hypertension.

Tenth Admission.—Her tenth admission was on Oct. 31, 1938. She was completely asymptomatic except for nocturnal enuresis. The results of the physical examination were essentially the same as on the last admission. Her height was 64 inches (163 cm.) and her weight 120 pounds (54.4 Kg.). The patient was menstruating. The systolic apical murmur on admission was the same as on previous admissions. There were no external stigmas of pituitary or adrenal dysfunction. The external genitalia were of the normal adult type. There was no hypertrophy of the clitoris.

Rectal Examination: The uterus was to the left of the midline, retroverted and of adult proportions as regards the relative cervical and fundal lengths. The left ovary was palpable.

Hormone Studies: Hormone studies of the urine were made by Dr. Raphael Kurzrock. In a four day specimen of urine there were 8 rat units of estrogen and 6½ capon units of androgen.

Blood Pressure: The systolic blood pressure remained approximately 180 mm. and the diastolic 115 mm.

Laboratory Data: The blood count was: hemoglobin content 15 Gm. per hundred cubic centimeters; erythrocytes 5,250,000 and leukocytes 8,000 per cubic millimeter; polymorphonuclears 64 per cent, of which 12 per cent were immature forms; lymphocytes 32 per cent; monocytes 2 per cent, and eosinophils 2 per cent. Results of chemical determinations on the blood were: urea nitrogen 9.1 mg. per hundred cubic centimeters, creatinine 0.5 mg., uric acid 2.6 mg., sugar 82 mg., serum cholesterol 228 mg. The carbon dioxide-combining power of the blood was 56 volumes per cent. The reaction to the Mantoux test (up to 0.5 mg. of tuberculin) was negative. Results of repeated examinations of the urine were negative except for an occasional faint trace of albumin. The basal metabolic rate was —9 per cent.

Roentgen Examination: Roentgenograms of the wrist showed that the epiphysial development was within normal limits. Roentgenograms of the ankle showed there were complete obliteration of the epiphysial plate at the lower end of the tibia and almost complete obliteration of the lower fibular epiphysial plate, indicating premature fusion.

Eleventh Admission.—The patient again entered the hospital on Dec. 1, 1938, where she remained until March 1, 1939. She was asymptomatic. Physical examination revealed that she was practically an adult. A gynecologic examination, performed rectally, gave the same results as on the last admission. Her weight was 124 pounds (56.2 Kg.). Repeated examinations of the eyegrounds gave negative results except for slight constriction of the arteries. Her intelligence quotient as determined by psychometric tests was 105.

Blood Pressure: The blood pressure readings varied from 180 mm. systolic and 120 mm. diastolic to 195 mm. systolic and 115 mm. diastolic.

Laboratory Data: Numerous examinations of the urine revealed merely an occasional faint trace of albumin. The blood count was: hemoglobin content (Sahli) 16.4 Gm. per hundred cubic centimeters; erythrocytes 5,400,000 and leukocytes 6,600 per cubic millimeter; polymorphonuclears 70 per cent, of which 12 per cent were immature forms; lymphocytes 20 per cent, and monocytes 10 per cent. Perirenal insufflation again gave normal results.

Tests for Suitability for Operation: It was decided to determine whether the child was a suitable patient for one of the operations for the relief of high blood pressure. Her reactions to three tests were carefully observed to see whether there was a reasonable chance that she might respond favorably to splanchnic resection and ganglionectomy.

Test 1: Five hundred and fifty milligrams of pentothal sodium in 9 cc. of physiologic solution of sodium chloride was injected intravenously over a forty minute period, 1 cc. at a time, to keep the patient constantly in fairly deep surgical anesthesia. The blood pressure was determined every five minutes. The blood pressure before the test was 174 mm. systolic and 108 mm. diastolic. The lowest pressures during the test were 162 mm. systolic and 104 mm. diastolic.

Test 2: One third of a grain (0.02 Gm.) of sodium nitrite was administered orally every half hour for six doses. The blood pressure at the beginning of the test was 180 mm. systolic and 108 mm. diastolic. The lowest pressures during the test were 162 mm. systolic and 104 mm. diastolic.

Test 3: Two grains (0.12 Gm.) of sodium amytal was administered orally every hour for three doses. The patient became drowsy. The blood pressure before the test was 178 mm. systolic and 110 mm. diastolic. The lowest pressures during the test were 162 mm. systolic and 100 mm. diastolic.

Since none of these three procedures resulted in a significant fall in blood pressure, it was decided not to submit the child to operation.

Therapy: Complete bed rest for two months had no effect on the constant hypertension. Ten high voltage roentgen ray treatments were applied to the pituitary gland,[9] the pituitary region being cross fired from two lateral portals. A total of 2,000 r was administered. This did not result in lessening of the hypertension. Up to 9 grains (0.58 Gm.) of sodium thiocyanate was administered daily by mouth. Determinations of the concentration of thiocyanate in the blood were made every three days. The concentration reached 6.4 mg. per hundred cubic centimeters of blood. There was no effect on the blood pressure.

Examination in Follow-Up Clinic.—When seen in the follow-up clinic on May 7, 1939, the child had a blood pressure of 190 mm. systolic and 120 mm. diastolic.

Twelfth Admission.—The last admission was on Oct. 10, 1939, when the patient was 12 years old. There had been no dizziness, vomiting, precordial or abdominal pain, dyspnea, orthopnea, fatigability or any other symptom. She had had only three headaches, of short duration. She had never had scarlet fever. The mother's systolic blood pressure was said to be 90 mm. of mercury, and the father's was reported as normal. Her height was 64½ inches (164 cm.) and her weight 137 pounds (62.1 Kg.). Normal weight for her age and height was 117 pounds (53.1 Kg.). Results of the physical examination were essentially the same as previously. The systolic murmur was heard at the second interspace, just to the left of the sternum, and was transmitted to the apex. The pulmonic second sound was accentuated and was louder than the aortic second sound. The liver and spleen were not enlarged. There were no abdominal masses. There were no signs of cardiac decompensation. The results of examination of the eyegrounds were negative except for definite diminution in the caliber of the arteries.

Blood Pressure: The blood pressure was 190 mm. systolic and 118 mm. diastolic.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 11.1 Gm. per hundred cubic centimeters; erythrocytes 4,210,000 and leukocytes 12,000 per cubic millimeter; polymorphonuclears 78 per cent, of which 12 per cent were immature forms; lymphocytes, 20 per cent; monocytes, 1 per cent, and eosinophils, 1 per cent. Results of chemical determinations on the blood were: total serum protein 6.9 Gm. per hundred cubic centimeters, albumin 4.03 Gm., globulin 2.87 Gm., cholesterol 213 mg., urea nitrogen 11.8 mg., creatinine 0.5 mg., uric acid 3.2 mg. and sugar 87 mg. The carbon dioxide-combining power of the blood was 54 volumes per cent. The electrocardiogram was normal. Roentgenograms of the skull and abdomen and teleroentgenograms of the heart and lungs gave normal results. Results of repeated examinations of the urine were negative except for a faint trace of albumin. The maximum specific gravity of the urine in the Fishberg test was 1.026.

CASE 2.—The patient, a boy aged 4 years, was admitted to the hospital on Dec. 15, 1931, and discharged on Feb. 21, 1932. While attempting to slide down the banister the day previous to admission, he had slipped and rolled down an entire flight of stairs. He complained of pain in the left side and voided almost pure blood several hours after the accident. He had vomited three times since his fall. The past history was essentially irrelevant. The boy had had measles two years previously and pertussis one year previously but had not had scarlet fever. Tonsillectomy had been performed three months before admission. The

9. Boswell, F. P.: Results of Roentgen Therapy in Essential Hypertension, South. M. J. **31**:1001-1003 (Sept.) 1938.

family history was noncontributory. The determinations of the blood pressure of six members of the family were normal.

The weight was 43 pounds (19.5 Kg.). The results of physical examination were essentially normal. The temperature ranged between 100 and 101 F. for the first week and then remained normal.

Examination of the fundi on January 6 revealed thickening of the retinal arteries, with diminution in caliber. Three weeks later examination of the eyegrounds gave negative results. Cystoscopic examination and bilateral ureteral catheterization on January 15 revealed nothing abnormal. A study of the capillaries of the nail bed by Dr. Sidney Leader on February 4 disclosed merely a slight increase in tortuosity of the tufts. Roentgenograms of the chest, taken January 27, demonstrated slight cardiac enlargement, with accentuation of the left auricular curve.

Blood Pressure.—The blood pressure, taken for the first time on Jan. 4, 1932, three weeks after the accident, was 170 mm. systolic and 120 mm. diastolic. On January 12 it was 156 mm. systolic and 90 mm. diastolic. January 28 the brachial readings were 138 mm. systolic and 88 mm. diastolic; the femoral readings were 158 mm. systolic and 100 mm. diastolic. On February 15 the blood pressure was 128 mm. systolic and 80 mm. diastolic.

Laboratory Data: The urine contained innumerable red blood cells on admission and a heavy trace of albumin. The erythrocytes in the urine steadily diminished in number and had disappeared by January 23. There were no casts. Results of chemical determinations on the blood were: (January 5) urea nitrogen 11.8 mg., creatinine 0.5 mg., uric acid 2.8 mg., sugar 87 mg., per hundred cubic centimeters, and carbon dioxide–combining power 48.1 volumes per cent; (January 18) total serum protein 6.9 Gm., serum albumin 4.4 Gm., serum globulin 2.5 Gm., serum cholesterol 133 mg. per hundred cubic centimeters; (January 22) serum cholesterol 145 mg., calcium 10.6 mg., phosphorus 4.7 mg. per hundred cubic centimeters. A urinary concentration test on January 13 gave a variation in specific gravity of from 1.005 to 1.022. The urinary excretion of phenolsulfonphthalein was 76 per cent in two hours. The Wassermann reaction was negative. An electrocardiogram was normal.

Second Admission.—The patient was readmitted to the hospital on March 7, 1933 for a follow-up study. He was free of symptoms. The results of physical examination were normal. The fundi were normal. The blood pressure was 116 mm. systolic and 70 mm. diastolic.

Laboratory Data: The results of chemical determinations of the blood were: urea nitrogen 12.5 mg. per hundred cubic centimeters, creatinine 0.5 mg., uric acid 3.3 mg., sugar 60 mg. The carbon dioxide–combining power of the blood was 39 volumes per cent. The Fishberg concentration test gave a maximum specific gravity of 1.030. The urinary excretion of phenolsulfonphthalein was 66 per cent in two hours. Results of urinalysis were negative.

Follow-Up Examinations.—The patient has since been observed eleven times in the follow-up clinic, and was last examined March 5, 1939. His systolic pressure has varied between 86 and 110 mm., his diastolic between 56 and 68 mm. He is in splendid condition. Results of all urinalyses have been negative.

CASE 3.—A boy aged 12 years was admitted to the hospital on Feb. 2, 1939 and discharged on April 2, free of symptoms. His complaints were night sweats for three years and intermittent precordial pain for one month. The pain was dull and pressing and occurred when the boy was at rest, as well as during activity.

It was associated with cardiac palpitations and facial pallor. The past history was irrelevant. The patient had never had scarlet fever. Tonsillectomy had been performed six years previously. The family history was noncontributory. His weight was 88½ pounds (40.1 Kg.) and his height 62 inches (157.5 cm.). The physical examination yielded normal results. The course was afebrile. The fundi were normal. Roentgenograms of the chest showed some increase of the hilar markings. The cardiac shadow was normal.

Blood Pressure.—The blood pressure was 160 mm. of mercury systolic and 90 mm. diastolic. After one week's rest in bed the blood pressure dropped to 112 mm. systolic and 70 mm. diastolic. When the patient was then allowed up, the blood pressure rose to 144 mm. systolic and 88 mm. diastolic, at which level it remained constant.

Laboratory Data: Frequent blood counts were similar to the count taken February 2 and showed: hemoglobin content (Sahli) 15.3 Gm. per hundred cubic centimeters; erythrocytes 4,850,000 and leukocytes 4,800 per cubic millimeter; polymorphonuclears 60 per cent, of which 10 per cent were immature forms; lymphocytes 27 per cent; monocytes 12 per cent, and eosinophils 1 per cent. The results of eight urinalyses were normal. The Fishberg concentration test gave a maximum specific gravity of 1.027. Results of chemical determinations on the blood were: urea nitrogen 13.1 mg. per hundred centimeters, creatinine 0.5 mg., uric acid 2.6 mg., sugar 80 mg.; serum calcium 9.5 mg. and phosphorus 5.4 mg. The carbon dioxide-combining power of the blood was 44.3 volumes per cent. The sedimentation rate was 1 mm. in thirty minutes, 6 mm. in an hour. Three electrocardiograms were normal. The patient reacted negatively to the intracutaneous administration of 0.5 mg. of old tuberculin. Tuberculosis did not develop in a guinea pig given intraperitoneal injections of gastric washings.

Follow-Up Examination.—He was seen at a follow-up clinic on June 15, 1940. There had been no symptoms since discharge. Results of physical examination were normal. After lying on his back in a quiet room for thirty minutes, the patient's blood pressure was 124 mm. systolic and 80 mm. diastolic. His response to the cold pressor test, performed according to the original method,[10] was: blood pressure at the end of thirty seconds, 152 mm. systolic and 96 mm. diastolic; at the end of one minute, 150 mm. systolic and 94 mm. diastolic. Five minutes after the test the blood pressure was 128 mm. systolic and 80 mm. diastolic. The mother's blood pressure taken at this time was 160 mm. systolic and 96 mm. diastolic.

CASE 4.—The patient, a white girl aged 11 years, was admitted to the ear, nose and throat service on Jan. 3, 1940 and discharged on January 14. For the four days prior to admission she had had a cold, with a temperature of 101 to 102 F., and earache on the right side. Five years previously mastoidectomy on the right had been performed. Three months later sinus thrombosis necessitated a second operation, at which time the right jugular vein was ligated. The tonsils had been removed

10. (*a*) Hines, E. A., Jr., and Brown, G. E.: Standard Stimulus for Measuring Vasomotor Reactions: Its Application in Study of Hypertension, Proc. Staff Meet., Mayo Clin. **7**:332-335, 1932; (*b*) A Standard Test for Measuring the Variability of Blood Pressure: Its Significance as an Index of the Prehypertensive State, Ann. Int. Med. **7**:209-217 (Aug.) 1933. (*c*) Ayman, D., and Goldshine, A. D.: Cold as a Standard Stimulus of Blood Pressure: A Study of Normal and Hypertensive Subjects, New England J. Med. **219**:650-655 (Oct. 27) 1938.

four and a half years before the present admission. The past history was otherwise irrelevant. The patient had never had scarlet fever. The family history was essentially noncontributory.

Her weight was 113 pounds (51.3 Kg.) and her height 59½ inches (151 cm.). The patient was obese and did not appear sick. The right ear drum was dull. The pharynx was congested. The fundi were normal. The temperature was 102 F. and fell to normal in thirty-six hours. Results of the physical examination were otherwise normal. Roentgenograms of the chest were normal.

Blood Pressure.—The blood pressure, taken for the first time when the girl had been in bed in the hospital for six days, was 144 mm. of mercury systolic and 96 mm. diastolic. Three days later it was 140 mm. systolic and 88 mm. diastolic. The lowest blood pressure reading, 128 mm. systolic and 88 mm. diastolic, was obtained on the day before discharge. The blood pressure in the legs was 158 mm. systolic and 108 mm. diastolic.

Laboratory Data: Results of urinalyses were negative. The blood count was: hemoglobin content (Sahli) 14 Gm. per hundred cubic centimeters; erythrocytes 4,780,000 and leukocytes 14,000 per cubic millimeter; polymorphonuclears 82 per cent, of which 20 per cent were immature forms; lymphocytes 16 per cent, and monocytes 2 per cent. Results of chemical determinations on the blood, per hundred cubic centimeters, were: urea nitrogen 4.3 mg, sugar 98 mg., total protein 8.73 Gm., serum albumin 3.78 Gm., serum globulin 4.95 Gm. and cholesterol 205 mg. The carbon dioxide–combining power of the blood was 51 volumes per cent. The Fishberg concentration test gave a maximum specific gravity of 1.030. The urea clearance was 127 per cent of normal. The basal metabolic rate was —7 per cent.

Case 5.—The patient, a girl aged 8 years, was admitted to the hospital Dec. 29, 1939 and discharged Jan. 10, 1940. She had had an infection of the upper respiratory tract for five weeks prior to admission, with sore throat, rhinitis and cough. Her temperature varied between 100 and 101 F. She was regarded by her parents as a nervous, high-strung child. The past history was essentially irrelevant. She had never had scarlet fever. Tonsillectomy had been performed at the age of 3 years and tenotomy for strabismus when she was 6 years old. The mother had had arthritis four years previously, which was believed to be on an allergic basis. Her systolic blood pressure was 90 mm. of mercury. The paternal grandmother had died of pulmonary tuberculosis before the patient was born.

Her weight was 85 pounds (38.6 Kg.) and her height 53 inches (135 cm.). The results of the physical examination were essentially normal except for some pharyngeal congestion and pea-sized enlargement of a few cervical lymph nodes. The patient's course was entirely afebrile. The fundi were normal. Roentgenograms of the chest revealed some accentuation of the bronchovascular markings and a normal cardiac shadow.

Blood Pressure.—Her blood pressure on admission was 130 mm. systolic and 90 mm. diastolic. Four days later it had risen to 152 mm. systolic and 94 mm. diastolic. During the remainder of her stay it fluctuated between 132 and 148 mm. systolic and 94 and 102 mm. diastolic. The blood pressure in the legs was 152 mm. systolic and 100 mm. diastolic.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 12.3 Gm. per hundred cubic centimeters; erythrocytes 4,960,000 and leukocytes 9,950 per cubic millimeter polymorphonuclears 72 per cent, of which 8 per cent were immature forms; lymphocytes 23 per cent; monocytes 3 per cent; eosinophils 1 per cent, and basophils 1 per cent. Results of urinalyses were negative. The

Fishberg concentration test elicited a maximum specific gravity of 1.032. Results of chemical determinations on the blood were: urea nitrogen 13.1 mg. per hundred cubic centimeters, creatinine 0.5 mg., uric acid 3 mg., sugar 86 mg., serum cholesterol 198 mm. The carbon dioxide–combining power of the blood was 49 volumes per cent. The urea clearance was 102.9 per cent of normal. The sedimentation rate was 9 mm. in forty-five minutes. The patient reacted negatively to the intracutaneous injection of 0.5 mg. of old tuberculin. The electrocardiogram was normal.

CASE 6.—A girl aged 11 years was admitted to the hospital on Jan. 1, 1940 and discharged on January 16. She had been having three to four watery green stools daily for the five weeks prior to admission and had suffered from tenesmus and sporadic pain in the left lower quadrant of the abdomen. On one occasion the stool had been blood streaked. During the past year she had lost 4 pounds (1,814 Gm.). She had been unhappy, because she had been obliged to live away from her family. The past history was irrelevant. She had never had scarlet fever. Tonsillectomy had been performed three years previously. The family history was not significant.

Her weight was 77 pounds (34.9 Kg.) and her height 60¾ inches (154 cm.). The patient was thin, unhappy and high strung. The results of the physical examination were normal. The fundi were normal. The patient's course was afebrile. Two proctoscopic examinations revealed no pathologic conditions. Roentgenograms of the abdomen and chest were normal, as was the result of a roentgen examination after a barium sulfate enema.

Blood Pressure.—The blood pressure was 132 mm. of mercury systolic and 90 mm. diastolic. On the sixth day of her hospital stay it was 144 mm. systolic and 90 mm. diastolic. Two days before discharge it was 142 mm. systolic and 110 mm. diastolic. The blood pressure in the legs was 158 mm. systolic and 100 mm. diastolic.

Laboratory Data: The blood count was: hemoglobin content (Sahli) 115 Gm. per hundred cubic centimeters; erythrocytes 4,130,000 and leukocytes 10,300 per cubic millimeter; polymorphonuclears 75 per cent, of which 30 per cent were immature forms, lymphocytes 24 per cent, and monocytes 1 per cent. Results of urinalyses were normal. Nonhemolytic Escherichia coli and a nonhemolytic enterococcus were obtained by culture of the stools. Results of chemical determinations on the blood were: urea nitrogen 10 mg. per hundred cubic centimeters, creatinine 0.5 mg., uric acid 2.3 mg. and sugar 71 mg. The sedimentation rate was 3 mm. in fifteen minutes and 8 mm. in forty-five minutes. The urea clearance was 112.8 per cent of normal. The Fishberg concentration test gave a maximum specific gravity of 1.026. The urinary excretion of phenolsulfonphthalein was 74 per cent in two hours. The Wassermann reaction was negative. The patient reacted negatively to the intradermal injection of 0.5 mg. of old tuberculin. The electrocardiogram was normal.

CASE 7.—The patient, a girl aged 10 years, was admitted to the hospital on Dec. 26, 1939 and discharged on Jan. 14, 1940, free of symptoms. She had had severe, generalized headaches for two months. They occurred about once a week and lasted five to six hours. Vomiting was a frequent accompaniment. For the two days prior to admission headache was constant. The past history was irrelevant. The patient had not had scarlet fever or any episode suggestive of acute nephritis. Tonsillectomy had been performed three years previously. The patient's father had suddenly died of heart disease when 32 years old.

Physical examination gave normal results. The weight was 83 pounds (37.6 Kg.) and the height 58 inches (147 cm.). The fundi were normal. The patient's

course was afebrile with the exception of a single rise of temperature to 101 F. Roentgenograms of the heart, lungs and abdomen were normal. Intravenous urographic examination gave normal results.

Blood Pressure.—The blood pressure was 150 mm. of mercury systolic and 85 mm. diastolic. During twelve days of bed rest it slowly dropped to 118 mm. systolic and 72 mm. diastolic. When the patient was allowed to get up, the blood pressure rose to 140 mm. systolic and 106 mm. diastolic, at which level it remained until discharge. The blood pressure in the lower extremities was 150 mm. systolic and 90 mm. diastolic.

Laboratory Data: Results of urinalyses were negative. The blood count was: hemoglobin content (Sahli) 13 Gm. per hundred cubic centimeters; erythrocytes 4,200,000 and leukocytes 9,850 per cubic millimeter; polymorphonuclears 71 per cent, of which 11 per cent were immature forms; lymphocytes 25 per cent; monocytes 3 per cent, and eosinophils 1 per cent. Results of chemical determinations on the blood were: urea nitrogen 10.3 mg. per hundred cubic centimeters, creatinine 0.5 mg., uric acid 3.6 mg., sugar 91 mg., serum protein 6.05 Gm., albumin 4.75 Gm., globulin 1.30 Gm. and cholesterol 157 mg. The carbon dioxide–combining power of the blood was 39.8 volumes per cent. The Fishberg concentration test gave a maximum specific gravity of 1.030. The urea clearance was 90 per cent of normal. The Addis count of the urine revealed 300 red cells per cubic centimeter in a twelve hour specimen, with no casts. The Wassermann reaction was negative.

Follow-Up Examination.—She was seen at a follow-up clinic on June 15, 1940. There had been no symptoms or any recurrence of headache since discharge. The mother remarked that she was nervous. After lying on her back in a quiet room for thirty minutes, the patient's blood pressure was 126 mm. systolic and 82 mm. diastolic. Her response to the cold pressor test[10] was: blood pressure at the end of thirty seconds, 154 mm. systolic, 104 mm. diastolic; at the end of one minute, 148 mm. systolic, 102 mm. diastolic. Four minutes later it was 130 mm. systolic, 90 mm. diastolic. Seven minutes after the test it was 124 mm. systolic, 80 mm. diastolic. The mother's blood pressure, taken at this time, was 110 mm. systolic, 74 mm. diastolic.

COMMENT

Case 1 is one of so-called essential hypertension and precocious puberty, in which the elevation of blood pressure is known to have been present for at least four years. The physical findings and the laboratory data were largely normal. Renal function remained good. The patient did not have the stigmas of the diencephalic syndrome. Hypertension of endocrine origin is improbable. Twelve determinations of the basal metabolic rate have all been within normal limits, as have been the concentrations of serum cholesterol. An adrenal cortical carcinoma may be excluded by the clinical course, the normal results from perirenal insufflation[11] and the excretion of estrogen in normal amounts.[12] Although the primary genetic agents in essential hypertension will not be discussed until later in this paper, it might be well

11. Cahill, G. F.: Air Injections to Demonstrate the Adrenals by X-Ray, J. Urol. **34**:238-243 (Sept.) 1935.

12. Frank, R. T.: Suggested Test for Functional Cortical Adrenal Tumor, Proc. Soc. Exper. Biol. & Med. **31**:1204-1206 (June) 1934.

to consider at this point whether the patient's precocious puberty might not have modified her reactions to such substances. It has recently been determined that young rats react to the injection of extracts containing renin with a much smaller rise in blood pressure than do old animals.[13] In other words, old and mature animals are much more sensitive to renin than are young and immature ones. Whether the patient's rapid maturity made her more susceptible to those agents which cause hypertension warrants consideration.

Case 2 is that of a boy who after a fall down a flight of stairs had pain in the left flank and passed almost pure blood in the urine. No casts were found. Renal function was normal. Determination of the blood pressure, made for the first time three weeks after the accident, revealed severe hypertension, which persisted, though in definitely lessening degree, for the five remaining weeks of his stay in the hospital. The blood pressure had returned almost to normal when taken again one year after discharge. An explanation of this case may be provided by the experiments in which persistent hypertension in animals was produced by the application of cellophane around one or both kidneys.[14] A thick fibrocollagenous hull formed about the kidney in three weeks, and marked elevation of blood pressure occurred at this time. Removal of the constricting hull often caused the hypertension to disappear. This fibrous capsule compressed the renal parenchyma under considerable tension, producing renal ischemia by a method different in principle from clamping of the renal artery. It is probable that the patient suffered a perirenal hematoma as a result of his fall. This hematoma caused renal ischemia by the same mechanism that operates in perinephritis caused by renal constriction with cellophane. With absorption of the hematoma the blood pressure returned to normal.

Patient 7 entered the hospital with severe headache, one of the commonest symptoms of hypertension in childhood.[1] This, with the precordial pain in case 3, was the only instance in this series of a symptom attributable to hypertension. With the exception of patient 2, who was admitted with traumatic hematuria, none of the other patients had any signs on examination which would arouse suspicion of an elevation of the blood pressure. In cases such as these, early or incipient hypertension can be detected only by routine determinations of blood pressure.

In adult life, cardiovascular-renal disease is a common accompaniment of hypertension. In none of these children has there so far been any evidence of cardiac enlargement, cardiac decompensation, thickening

13. Grossman, E. B., and Williams, J. R.: Relation of Age to Renal Pressor Substance, Arch. Int. Med. **62**:799-804 (Nov.) 1939.

14. Page, I. H.: The Production of Persistent Hypertension by Cellophane Perinephritis, J. A. M. A. **113**:2046-2048 (Dec. 2) 1939.

and sclerosis of the arteries of the extremities or diminution in renal function. It may be of passing interest to mention that every child had had tonsillectomy prior to the discovery of hypertension.

The individual work-up of these 7 cases was not completely satisfactory. However, in the vast majority of reported cases [1] the work-up was much more limited. In addition to the routine history, physical and fundoscopic examination, urinalysis and chemical determinations on the blood, the minimum basic requirements for an adequate study of cases of so-called essential hypertension in childhood are: (1) determinations of the blood pressure of parents and relatives; (2) determinations of the blood pressure in the lower extremities; (3) intravenous urogram and, if necessary, retrograde pyelogram; (4) Fishberg concentration test; (5) Addis count; (6) determination of urea clearance; (7) teleroentgenogram of the chest; (8) electrocardiogram; (9) determination of the basal metabolic rate; (10) when indicated, perirenal insufflation (this procedure is not without danger [15]); (11) determination of the response to sodium nitrite, sodium amytal and, if necessary, intravenous injection of pentothal sodium; (12) observation of the behavior of the blood pressure during sleep; (13) determination of the response to the cold pressor test, especially in those patients in whom the blood pressure drops to normal during observation or after discharge. This routine is important, not merely for diagnosis, but for prognosis and even for treatment as well.

Hypertension in the parents (1) makes it much more likely that permanent hypertension will develop in the child some time during its life.[3] The Fishberg concentration test (4) and determination of the urea clearance (5) will detect beginning impairment of renal function, which in childhood bears a poor prognosis.[1w] Teleroentgenograms of the chest (7) and electrocardiograms (8) may disclose cardiac damage, which has a similar import. Intravenous urograms and retrograde pyelograms (3) can demonstrate whether urinary obstruction, hydronephrosis or pyelonephritis is the cause of the hypertension,[16] and discovery of such a cause may change the ultimate prognosis, since hypertension in childhood resting on such a basis has already been cured by operative measures.[17] Roentgenographic study of the genitourinary tract by contrast mediums in 2 cases in this series revealed nothing abnormal, however. A negative response to the oral and intravenous

15. Weyrauch, H. E., Jr.: Death from Air Embolism Following Perirenal Insufflation, J. A. M. A. **114**:652-653 (Feb. 24) 1940.

16. Schroeder, H. A., and Steele, J. M.: Abnormalities of the Urinary Tract in "Essential" Hypertension, Proc. Soc. Exper. Biol. & Med. **39**:107-108 (Oct.) 1938.

17. Butler, A. M.: Chronic Pyelonephritis and Arterial Hypertension, J. Clin. Investigation **16**:889-897 (Nov.) 1937.

administration of barbiturates, to the oral administration of sodium nitrite (11) and to sleep (12), as in case 1, indicates that any treatment, medical or surgical, will probably be ineffective.[18] A child whose blood pressure has dropped to normal from an elevated level but who nevertheless reacts positively to the cold pressor test (13) should be carefully watched for hypertension later in life.

The usefulness of the suggested routine in detecting hypertension resulting from such causes as coarctation of the aorta, nephritis, hyperthyroidism or pheochromocytoma is so obvious as to need no comment.

Although many studies of blood pressure in childhood [19] have been made, the normal levels at different ages have by no means been definitely set. Be that as it may, there is a growing realization that in adults, at least, the upper limits of normal blood pressure must be drastically lowered. Robinson and Brucer,[2] as a result of a careful and extensive study of the blood pressures of 11,383 persons, 500 of whom were continuously followed for from five to ten years, recently came to the conclusion that the normal range of systolic pressure for men and women is from 90 to 120 mm. of mercury and the normal range of diastolic pressure is from 60 to 80 mm. They have further demonstrated that in adult life normal blood pressure does not rise with age and that the mortality rate increases progressively with an increase in systolic or diastolic pressures above these levels. Each of the 7 children in the series here reported on had, on at least three different occasions, systolic pressures of 140 mm. or over after having been at complete bed rest for two days or longer. The diastolic pressures in all were, on at least two occasions, 90 mm. or over. In 5 children the diastolic pressures were 100 mm. or over. It is thus obvious that the pressures in these children reached hypertensive levels, even according to modern adult standards.

Abt and Feingold [19a] have stated that astonishingly high blood pressures, from 150 to 160 mm. of mercury systolic, may be found in normal adolescent children and that these pressures fall without any treatment and without in any way impairing future health. This impression, unfortunately, still lingers in pediatric circles. These authors gave no figures, cited no detailed case reports and did not present follow-up data on the status of these adolescents in late adult life. That an elevation

18. Craig, W. M.: Essential Hypertension: The Selection of Cases and Results Obtained by Supradiaphragmatic Extensive Sympathectomy, Surgery **4**:502-509 (Oct.) 1938.

19. (*a*) Abt, A. F., and Feingold, B. F.: Blood Pressure in Infancy and in Childhood, Am. J. Dis. Child. **40**:1285-1311 (Dec.) 1930. (*b*) Richey, H. G.: Blood Pressure in Boys and Girls Before and After Puberty, ibid. **42**:1281-1330 (Dec.) 1931. (*c*) Taussig and Hecht.[5]

of blood pressure may occur temporarily during adolescence is unquestionably true. Indeed, in a country one fifth of whose adult population is hypertensive,[2] it would be surprising if such instances were not found. But that such elevations of blood pressure during adolescence are normal and a sign of future health has yet to be proved.

Hines,[20] in a determination of the blood pressure of 400 school children 6 to 19 years of age, found 4 in whom it was over 150 mm. systolic and 90 mm. diastolic, and 14 in whom it was over 140 mm. systolic and 80 mm. diastolic. An even more important observation was that 18 per cent of these children were hyperreactors to the cold pressor test. In another series, Hines [3d] observed the transition from the hyperreactive state to so-called essential hypertension in a five year period. From his own and other work he concluded that the hyperreactive state in persons with normal blood pressure represents a prehypertensive stage of essential hypertension.

The evidence that this is so is impressive. A recent follow-up study of the original group of apparently normal subjects studied with the cold pressor test by Hines and Brown disclosed that hypertension had developed in 38 per cent of the hyperreactors and that none of the normal reactors had hypertension six years after the original study.[21] Hines,[3d] in a series of 508 persons, found that a family history positive for hypertensive cardiovascular disease was five times as frequent (in 80 per cent) among hyperreacting persons with normal blood pressure as it was among persons who had a normal blood pressure and a normal reaction to the cold pressor test. In a group of 256 people, he found that if both parents had a normal blood pressure and were normal reactors all of their children were normal reactors. If both parents had hypertension or were hyperreacting "normals," however, 95 per cent of their children had hypertension or were hyperreactors to the test. It is known that at least 98 per cent of all subjects who actually have hypertension of the essential form exhibit a positive reaction to the test.[10b]

The reactions to the cold pressor test of patients 3 and 7 in the present series were instructive. Both children had had, of course, definite hypertension when observed in the hospital. When seen at the follow-up clinic, their basal blood pressure had dropped to levels which some pediatricians might consider not significantly elevated for their age group (124 mm. systolic and 80 mm. diastolic and 126 mm. systolic and 82 mm. diastolic). The children were free of symptoms. Both proved, however, to be hyperreactors to the cold pressor test.

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20. Hines, E. A.: Reaction of the Blood Pressure of Four Hundred School Children to a Standard Stimulus, J. A. M. A. **108**:1249-1250 (April 10) 1937.

21. Allen, E. V., and Hines, E. A., Jr.: Fluctuations of Blood Pressure, Mod. Concepts Cardiovasc. Dis., 1939, vol. 8, no. 11.

It is clear that a positive reaction to the cold pressor test is closely connected with the hypertensive state. Hyperreacting children should be carefully watched for the development of permanent hypertension later in life. Children who actually have periods of elevation of blood pressure to hypertensive levels deserve, if anything, more careful observation even if their pressures return to normal and if they are free of symptoms and have no abnormal physical conditions or laboratory data. Robinson and Brucer [2] have demonstrated in adults that once the pressure shows even intermittent rises into the danger zone of 120 to 140 mm. it frequently returns to that level. Such intermittent excursions tend to become more frequent and denote incipient hypertension. Doxiades [1p] stated that with advancing years permanent hypertension, with its sequelae, may follow "harmless," transitory hypertension of childhood.

When obtained in office practice, transitory elevations of blood pressure in children are frequently ascribed to "nervousness" and are disregarded. It should be emphasized that strong emotions roughly duplicate the effects of the cold pressor test on the blood pressure.[21] An important difference is that whereas the cold pressor and breath-holding [22] tests can be carefully standardized, psychic stimuli obviously cannot. In a follow-up study of 1,500 patients with originally normal blood pressures, it has been found that 70 per cent of the patients who, as a result of nervous stress, had an original elevation in pressures into the ranges of 140 to 150 mm. systolic and 85 to 100 mm. diastolic had hypertension subsequently.[21] Intermittent elevations of blood pressure in a child or adult should no more be ignored than the intermittent excretion of sugar in the urine. Just as in the latter case determinations of blood sugar and dextrose tolerance tests should be performed, so in the case of the child suspected of hypertension further studies should be instituted.

It seems justified as a working hypothesis at present to regard the hypertensive state as frequently having its origins in childhood. Glomset,[3a] as a result of determinations of the blood pressure of 2,400 high school students, stated that hypertension begins in childhood and may continue to old age. Robinson and Brucer [2] remarked that high blood pressure is a long term disease having its genesis at an early age and that it does not suddenly emerge with middle life.

As a result of a realization of the importance of determinations of blood pressure in childhood, it was possible to discover 5 of the 7 cases of so-called essential hypertension reported here within a period of only a few months. Necropsy material is not available, since none of the

22. Ayman, D., and Goldshine, A. D.: Breath Holding Test: Simple Standard Stimulus of Blood Pressure, Arch. Int. Med. **63**:899-906 (May) 1939.

children has died. These are not instances of children with the relatively rare malignant hypertension of childhood but represent, as a whole, the far more important group of children from whom the vast army of adults with hypertension is later recruited.

The term "essential hypertension" is a poor one. With the rapid advancement of knowledge, it will probably soon be discarded. A careful study of a large series of patients with "essential" hypertension will reveal many in whom the hypertension has been caused by a variety of overlooked causes.[23] Prominent among these are obstructive lesions of the urinary tract.[16] When this fraction of the cases is excluded, there remains an enormous and fairly homogeneous group of subjects with so-called essential hypertension, in whom the elevation of blood pressure seems to be initiated by a common mechanism. McCann,[24] in a recent review, stated that at present it seems probable that in 80 to 85 per cent of the cases of essential hypertension the condition depends on atheromatous narrowing of the larger renal arteries at or near the aorta and that in 15 to 20 per cent the trouble is due to unsuspected disorders of the kidneys or urinary passages. Whether atheroma of the main renal arteries, renal arteriolosclerosis or some other disorder of the renal vascular system is principally responsible for "essential" hypertension has not yet been definitely determined. In any event, it appears at present that renal ischemia is the common initiating mechanism of the disease in the vast majority of living subjects with hypertension in whom an intensive clinical and laboratory study reveals no cause for the elevation of blood pressure. It is believed that the children reported on in this paper fall into this group, since thorough clinical investigation detected no causes for the elevation of blood pressure.

Diminution of renal blood flow is, however, only the initial factor in a complex mechanism which is responsible for hypertension.[8] When blood flow to the normal isolated dog's kidney is reduced by constricting the renal artery, renin is produced.[25] This substance, first extracted from the kidney in 1898 by Tigerstedt and Bergmann[26] and purified over forty years later,[27] has recently been shown to possess by itself no

23. Schroeder, H. A., and Steele, J. M.: Studies on "Essential" Hypertension: I. Classification, Arch. Int. Med. **64**:927-952 (Nov.) 1939.

24. McCann, W. S.: Bright's Disease: A Review of Recent Literature, Arch. Int. Med. **65**:638-658 (March) 1940.

25. Kohlstaedt, K. G., and Page, I. H.: Production of Renin by Constricting Renal Artery of an Isolated Kidney Perfused with Blood, Proc. Soc. Exper. Biol. & Med. **43**:136-140 (Jan.) 1940.

26. Tigerstedt, R., and Bergmann, P. G.: Niere und Kreislauf, Skandinav. Arch. f. Physiol. **8**:223, 1898.

27. Helmer, O. M., and Page, I. H.: Purification and Some Properties of Renin, J. Biol. Chem. **127**:757-763 (March) 1939.

pressor properties.[28] When renin is incubated with renin activator, normally present in serum, a powerful, basic, pressor substance is obtained, which Page [28] has named "angiotonin." Angiotonin, obtainable in pure crystalline form, does not bring about a lowering of the temperature of the skin. Five tenths of a milligram of angiotonin picrate injected intravenously will elevate the arterial pressure of a pithed cat by almost 90 mm. of mercury. This work appears to be an important step toward the identification of that almost mythical pressor substance which has eluded investigators for decades. Hypertension should be regarded as the result of a primary genetic agent acting on a substrate. The substrate will, of course, vary with each subject. Cases in which children are the substrate should prove of value in studying so-called essential hypertension in pure form, before the picture has been complicated by the changes incident to late adult life and senescence.

CONCLUSIONS

Seven cases of so-called essential hypertension in childhood are reported.

Transitory or intermittent elevations of blood pressure to hypertensive levels in children and adolescents should not be disregarded. They may point to the development of permanent hypertension later in life.

A routine for the study of children with persistent or transitory hypertension is recommended.

The hypertensive state in adult life frequently has its origins in childhood. It may be detected at this time by utilizing frequent, routine determinations of blood pressure and the cold pressor test in the study of both children and their parents.

Present concepts of so-called essential hypertension are discussed.

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28. Page, I. H., and Helmer, O. M.: A Crystalline Pressor Substance (Angiotonin) Resulting from the Reaction Between Renin and Renin Activator, J. Exper. Med. **71**:29-42 (Jan.) 1940.

WIDTH-WEIGHT TABLES (REVISED)

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One of the best measures of health available is nutritional status. It is important, then, to have an adequate measuring rod with which to judge the state of nutrition.

A number of observers [1] have pointed out the inadequacy of the old height-weight-age tables, which are based on averages and consequently fail to recognize individual differences. It is now believed necessary to recognize the range and distribution around the average of measurements of height and of width for a given age in order to judge nutrition. The first width-weight tables [2] were compiled after taking body build into consideration, and they record seven different weights for each height, according to the relative width of each subject. The width-length index (the figure for the biiliac diameter divided by that for the standing height and multiplied by 1,000) is a numerical expression of the relative width or body build of a subject.[3] Careful checking has shown the width-length index to be consistent and to have high validity as a measure of body build. Width-length indexes, calculated every six months over a four year period for 100 adolescent girls and 100 adolescent boys, were found to be reliable for predicting body build during the period of most rapid growth. Correlation of odd and even halves of the test material yielded values from plus 0.88 to plus 0.94 for r. On this basis, the width-length index appears to be a valid measure of body build, since a child found to be 8 per cent broader than the average for his age-sex group at the age of 10 years was found to have remained approximately 8 per cent broader than average when he had attained the age of 14 years. The converse was also true.

1. Dublin, L. I., and Gebhart, J. D.: Do Height and Weight Tables Identify Undernourished Children? Publication 129, New York Association for Improving the Condition of the Poor, 1924. Turner, C. E.: Weighing and Measuring School Children, in Abstracts of Scientific and Technical Publications from the Massachusetts Institute of Technology, Cambridge, Mass., The Institute, July 1931, no. 8, p. 10. Clark, T.; Sydenstricker, E., and Collins, S. D.: Pub. Health Rep. **39**:518, 1924.

2. Pryor, H. B.: Width-Weight Tables, Stanford University, Calif., Stanford University Press, 1936.

3. Pryor, H. B., and Stolz, H. R.: Determining Appropriate Weight for Body Build, J. Pediat. **3**:608, 1933.

It is obvious from examination of the accompanying photographs of 2 normal girls that averaging weight for a given height is not adequate as a measure of normal weight. It is also obvious that the body width factor is an important element which must be taken into consideration. The width-weight tables indicate the mathematical relation between relative width and weight of the human body, based on measurements of 10,600 subjects.

Another aspect of individual differences which must be taken into consideration is the marked difference in physiologic development possible between 2 children of a given chronologic age. This is most

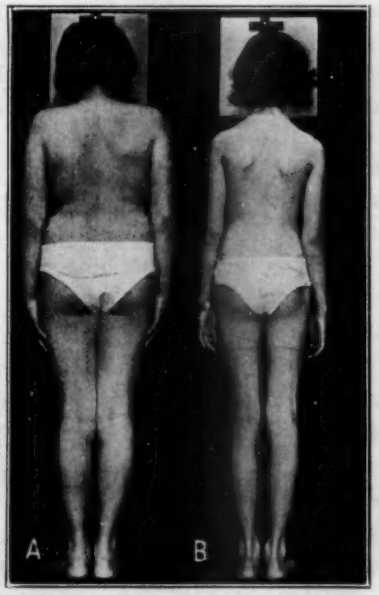

Illustration of difference between the widths of two healthy girls matched for age and height. *A*, subject 11.4 years old, height 152.7 cm., weight 57.9 Kg., sitting height 76.4 cm., biacromial diameter 35.7 cm. and biiliac diameter 26.7 cm. *B*, subject 11.3 years old, height 151.8 cm., weight 33.8 Kg., sitting height 78 cm., biacromial diameter 26 cm. and biiliac diameter 23 cm.

striking during the early adolescent years and is illustrated by marked differences in the size and strength, in the bone age, in the appearance of secondary sex characteristics and in many other ways.[4]

These various anatomic and physiologic differences in children matched for age indicate the marked differences in various aspects of growth and development and seem to offer adequate proof of different

4. Pryor, H. B., and Carter, H. D.: Phases of Adolescent Development in Girls, California & West. Med. **48**:89, 1938.

endocrine patterns. Broad and slender types of children of the same chronologic age illustrate different rates of speed in traveling down the road from birth to maturity. Developmental age, as measured by physiologic status, serves to differentiate types of children. This developmental age as described by T. Wingate Todd is a more important factor in judging nutrition than is chronologic age.

I have demonstrated that if a 6 year old boy is as tall as the average 9 year old boy, it is probable that he will also be as broad as the average 9 year old boy and therefore should weigh as much as the average 9 year old boy. Normal weight for the large 6 year old boy should be judged in terms of his developmental rather than his chronologic age. The converse of this also holds true; that is, the child who is small for his age should be judged in terms of his younger developmental rather than his chronologic age. The revision of the width-weight tables has taken this into consideration. Body widths were distributed for each inch of height, regardless of age, and correlations were made to find the relation between width and weight at every height. Revised tables indicate the range of height for each age and show the overlapping with the ages above and below. However, developmental age as indicated by standing height should be given more importance than chronologic age in determining nutritional status.

There are a few subjects whose body builds or endocrine patterns are hard to identify, for example, those whose hips appear to belong to one type and chest to another. In adolescent girls in whom the chest is narrow and the hips broad, neither diameter represents body width.

The only measurement of body width used in the first width-weight tables was the biiliac diameter. The revised width-weight tables take lateral measurements of the chest into consideration also.

For each age and each sex the following correlations were made: weight with height, weight with biiliac diameter, weight with thoracic lateral diameter, height with thoracic lateral diameter, height with biiliac diameter and biiliac diameter with thoracic lateral diameter. A multiple correlation formula was worked out for each age-sex group to express the relation between weight and width of the body. The formula may be expressed as:

$$W = C - (b_{14.23})\ (L) - (b_{13.23})\ (Bi) - (b_{12.34})\ (H),$$

in which when W is weight prediction and $b_{14.23}$ is the partial correlation of weight and lateral thoracic diameter, $b_{13.23}$ is the partial correlation of weight and biiliac diameter, $b_{12.34}$ is the partial correlation of weight and height, C is the constant from the regression formula, L is the lateral thoracic diameter, Bi is the biiliac diameter and H is height.

Three different values for L were substituted in the formula to provide tables for the 8, 50 and 92 percentile rankings. The constant

from each regression equation was used to calculate weight predictions for each inch of height of the range at a given age for different widths of hips. The mean biiliac measurement heads the central column of

Height-Width-Weight Table for Fifteen Year Old Girls

		Biiliac Diameter								
		8.8 in. 22.3 cm.	9.2 in. 23.4 cm.	9.6 in. 24.5 cm.	10.0 in. 25.4 cm.	10.3 in. 26.2 cm.	10.6 in. 27.0 cm.	11.0 in. 27.9 cm.	11.4 in. 29.0 cm.	11.8 in. 30.1 cm.
	Height in Inches	Weight in Pounds								
I. For narrow chest: lateral thoracic width up to 22.2 cm.	57	78	81	85	88	91	94	97	101	105
	58	79	82	86	89	92	95	98	102	106
	59	81	84	88	91	94	97	100	104	108
	60	83	86	90	93	96	99	102	106	110
	61	85	88	92	95	98	101	104	108	112
	62	87	90	94	97	100	103	106	110	114
	63	88	91	95	98	101	104	107	111	115
	64	89	92	96	99	102	105	108	112	116
	65	90	93	97	100	103	106	109	113	117
	66	92	95	99	102	105	108	111	115	119
	67	93	96	100	103	106	109	112	116	120
	68	94	97	101	104	107	110	113	117	121
	69	96	99	103	106	109	112	115	119	123
	70	97	100	104	107	110	113	116	120	124
	71	98	101	105	108	111	114	117	121	125
II. For medium chest: lateral thoracic width from 22.3 cm. to 25.1 cm.	57	89	92	96	99	102	105	108	112	116
	58	90	93	97	100	103	106	109	113	117
	59	92	95	99	102	105	108	111	115	119
	60	94	97	101	104	107	110	113	117	121
	61	95	99	103	106	109	112	115	119	123
	62	97	101	105	108	111	114	117	121	125
	63	98	102	106	109	112	115	118	122	126
	64	99	103	107	110	113	116	119	123	127
	65	100	104	108	111	114	117	120	124	128
	66	102	106	110	113	116	119	122	126	130
	67	103	107	111	114	117	120	123	127	131
	68	104	108	112	115	118	121	124	128	132
	69	106	110	114	117	120	123	126	130	134
	70	107	111	115	118	121	124	127	131	135
	71	108	112	116	119	122	125	128	132	136
III. For broad chest: lateral thoracic width of 25.2 cm. or more	57	99	103	107	110	113	116	119	123	127
	58	100	104	108	111	114	117	120	124	128
	59	102	106	110	113	116	119	122	126	130
	60	104	108	112	115	118	121	124	128	132
	61	106	110	114	117	120	123	126	130	134
	62	108	112	116	119	122	125	128	132	136
	63	109	113	117	120	123	126	129	133	137
	64	110	114	118	121	124	127	130	134	138
	65	111	115	119	122	125	128	131	135	139
	66	113	117	121	124	127	130	133	137	141
	67	114	118	122	125	128	131	134	138	142
	68	115	119	123	126	129	132	135	139	143
	69	117	121	125	128	131	134	137	141	145
	70	118	122	126	129	132	135	138	142	146
	71	119	123	127	130	133	136	139	143	147

figures in each table. Biiliac measurements in intervals above and below the mean head the columns to the right and to the left of the center. To find the predicted weight, it is necessary first to find the given height in the left hand column and then to match the measurement for the biiliac diameter against the figures at the head of each column.

A set of three tables was constructed for each age and sex: one for narrow chests, one for average chests and one for wide chests. These

three tables were constructed to fit the 8, 50 and 92 percentile rankings of lateral thoracic diameters. The same intervals for the measurements for the biiliac diameter were used in all three tables. For example, a boy with an average hip width and a broad chest would be matched in the center column of the 92 percentile table, while another boy with an average hip measurement and a narrow chest would be matched in the center column of the 8 percentile table.

Revised width-weight tables, therefore, predict body weight in terms of width of hips and width of chest, as well as height, for each age and sex.

An example of the revision, the table for 15 year old girls, is given on page 303.

RELATION OF TONSILLECTOMY AND OF ADENOIDECTOMY TO THE INCIDENCE OF POLIOMYELITIS

WITH SPECIAL REFERENCE TO THE BULBAR FORM

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There has been an increasing interest in the relation of tonsillectomy and adenoidectomy to poliomyelitis in recent years. A high incidence of the bulbar form has been consistently reported among the patients with poliomyelitis who had had their tonsils and adenoids removed a short time prior to the illness. The number and type of such cases of poliomyelitis previously reported are listed in table 1 according to the day after tonsillectomy [1] that the disease developed.

The high proportion of cases of the bulbar form of poliomyelitis occurring shortly after tonsillectomy is paralleled by the results of Sabin's experiments on monkeys.[2] He found that injection of moderate amounts of virus into the tonsillopharyngeal region produced poliomyelitis with involvement of the nuclei of the cranial nerves in 13 of 16 monkeys, while there was involvement of these structures in only 15 of 250 monkeys in which the disease developed after nasal instillation of virus. Sabin concluded that in most of these monkeys the virus entered and reached the nuclei of the cranial nerves along the nerves supplying the tonsillopharyngeal region.

This clinical and experimental evidence, as well as that discussed in a previous report,[3] indicates a causal relation between recent tonsil-

This study was aided by a grant from the National Foundation for Infantile Paralysis, Inc.

From the Department of Pediatrics, New York University, and the Statistical Bureau of the Metropolitan Life Insurance Company.

1. Tonsillectomy is used throughout this paper to denote tonsillectomy and adenoidectomy.

2. Sabin, A. B.: Experimental Poliomyelitis by the Tonsillopharyngeal Route, with Special Reference to the Influence of Tonsillectomy on the Development of Bulbar Poliomyelitis, J. A. M. A. **111**:605 (Aug. 13) 1938.

3. Stillerman, M., and Fischer, A. E.: Acute Bulbar Poliomyelitis Following Recent Tonsillectomy and Adenoidectomy, Am. J. Dis. Child. **56**:778 (Oct.) 1938.

TABLE 1.—*Mortality From and Type of Poliomyelitis Developing Shortly After Tonsillectomy*

Authors	Number of Cases of All Types	Cases of Bulbar Form	Interval Between Tonsillectomy and Onset of Poliomyelitis, Days																											Died
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	
Ayer, W. D.‡: Proc. Internat. Assemb. Inter-State Post-Grad. M. A., North America (1928), 1929, p. 319	9	9	..	..	..	..	——	5 to 10	——			..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	Not stated
Aycock, W. L., and Luther, E. H.§: New England J. Med. **200**: 164, 1929	16	11	..	..	..	..	..	..	*	..	*	*	* *	†	† *	† † *	*	* *	..	† *	..	..	..	..	..	..	..	..	..	..	..	..	3
Silverman, A. C.‡: Am. J. Dis. Child. **41**: 829 (April) 1931	5	4	..	..	..	..	..	..	..	..	——	——	——	——	9 to 19	——	——	——	——	——	——	..	..	..	..	..	..	..	..	..	..	..	Not stated
Stillerman, M., and Fischer, A. E.: Am. J. Dis. Child. **54**: 984 (Nov.) 1937	13	9	..	..	..	..	..	..	..	..	..	* * * † †	*	* †	..	* *	..	*	..	..	..	..	*	†	..	..	..	..	..	..	..	..	..	3
Reports on Poliomyelitis in Ontario, Department of Health, Province of Ontario, March 1938	9	4	..	..	..	..	..	..	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	——	..	..	..	..	..	3
Eley, R. C., and Flake, C. G.§: J. Pediat. **13**: 63, 1938	25	17	..	..	..	..	..	..	†	†	..	* * * †	* *	..	*	* * * *	*	* *	..	*	*	*	..	..	..	†	†	†	..	..	†	†	1
Pamment, H. G.: Ohio State M. J. **34**: 1118, 1938	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	0
Anderson, D. M., and Dixon, J. H.: Brit. M. J. **2**: 1077, 1938	2	2	..	..	..	..	..	..	..	..	..	*	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Koskoff, Y. D.; Amshel, J., and Lebeau, S.: Arch. Pediat. **56**: 19, 1939	2	2	..	..	..	..	..	..	..	*	..	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	2
Stebbins, E. L.; Gillick, E. E., and Ingraham, H. S.: J. A. M. A. **113**: 1569 (Oct. 21) 1939	1	1	..	..	..	..	..	..	..	..	..	..	..	..	..	*	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1
Kramer, S. D.; Gilliam, A. G., and Molner, J. G.: Pub. Health Rep. **54**: 1914, 1939	3	1	..	..	..	..	..	..	..	..	..	..	†	..	..	..	..	..	..	†	..	..	..	..	..	*	..	..	..	..	..	..	1
Fischer, A. E.; Stillerman, M., and Marks, H. H.‖: Present report	12	7	..	..	†	..	..	..	† ..	* *	* ..	* ..	.. ..	* ..	.. ..	† ..	.. ..	.. ..	.. ..	† ..	.. ..	.. ..	.. ..	.. ..	.. ..	* ..	.. ..	* †	.. ..	.. ..	.. ..	.. ..	2

* Indicates patient with bulbar poliomyelitis. † Indicates patient with nonparalytic or spinal poliomyelitis.

‡ Cases reported by Silverman and by Ayer occurred in the same outbreaks in Syracuse, and some of Ayer's cases were included in experience reported by Silverman.

§ Three cases of the bulbar type included in the series of Eley and Flake were previously reported by Aycock and Luther.

‖ Three of the cases included in this report were previously reported in the study published by the Ontario Department of Health.

lectomy and the development of the bulbar form of poliomyelitis. However, the small number of reported cases of poliomyelitis following tonsillectomy in various outbreaks and the absence of studies giving the incidence of tonsillectomy just prior to and during an epidemic made it impossible to evaluate fully the relation between the operation and the incidence of the disease.

An epidemic which had occurred in the Province of Ontario, Canada, in 1937, provided an opportunity to study this question. An excellent report on that outbreak,[4] published by the Ontario department of health, gave some consideration to this aspect of the disease. We limited our investigation to the city of Toronto. Since our plan of study was based on a survey of the incidence of tonsillectomy among elementary school children, practically all of whom were 5 to 14 years old in 1939 (3 to 12 years old in 1937), only those patients who contracted poliomyelitis in the epidemic of 1937 who were from 3 to 12 years old at that period were included in this study.

I. CHARACTERISTICS OF THE GROUP OF TONSILLECTOMIZED AND NONTONSILLECTOMIZED CHILDREN WITH POLIOMYELITIS

There were 507 Toronto children between 3 and 12 years of age who were treated in the city of Toronto for poliomyelitis during the 1937 epidemic. Of these, 74 per cent were institutionalized at the Hospital for Sick Children and the Riverdale Isolation Hospital and 26 per cent were treated at home. The hospital and board of health records of the hospitalized patients and of those treated at home were reviewed, and the name, age, date of onset, type of poliomyelitis, presence or absence of tonsils, date of tonsillectomy and date of death were listed. A public health nurse obtained this information from the parents of all patients treated at home and of those whose hospital record contained no statement with respect to the presence or absence of tonsils.

History of Tonsillectomy.—Of the 507 patients, there were 231 whose tonsils and adenoids had been removed, 267 in whom the tonsils were present and 9 for whom there were no data. The date of operation was obtained for all the tonsillectomies performed, and when the operation was reported to have been done in 1937 that fact was checked with the surgeon or with the hospital records. The tonsillectomized and nontonsillectomized groups were classified according to the month of occurrence, the age at the time of onset, the type of poliomyelitis and the mortality.

Monthly Incidence.—There was no significant difference between the tonsillectomized and the nontonsillectomized patients in this respect.

4. Report on Poliomyelitis in Ontario, 1937, Department of Health, Province of Ontario, March 1938.

Both groups showed an increase in the number of cases during the last week in July, when the epidemic began. The prevalence of cases was high during August and September, with the peak occurring in the last week in August (table 2).

Age at Onset of Poliomyelitis.—The proportion of tonsillectomized children in this series, as was expected, increased with age. Up to the age of 6 years, the number of children with intact tonsils was greater

TABLE 2.—*Month of Onset of Poliomyelitis During 1937 in Children in Toronto Between the Ages of 3 and 12 Years, With and Without Tonsils and Adenoids*

Month	Total Number of Patients with Poliomyelitis	Patients with Tonsils and Adenoids Absent	Patients with Tonsils and Adenoids Present	No Information
June	2	1	1	..
July	8	4	4	..
August	231	100	126	5
September	230	108	119	3
October	33	18	14	1
November	3	..	3	..
Total	507	231	267	9

TABLE 3.—*Age at Onset of Poliomyelitis of Children Between the Ages of 3 and 12 Years With and Without Tonsils and Adenoids in Toronto During 1937*

Age, Year	Total Number of Patients	Patients with Tonsils and Adenoids Absent	Patients with Tonsils and Adenoids Present	No Information
3	62	13	48	1
4	66	18	46	2
5	66	26	39	1
6	75	31	43	1
7	55	30	24	1
8	44	21	22	1
9	46	32	12	2
10	30	22	8	..
11	38	20	18	..
12	25	18	7	..
Total	507	231	267	9

than the number whose tonsils had been removed. After that age the tonsillectomized children were in the majority (table 3).

Type of Poliomyelitis and Mortality.—The percentage of cases of the bulbar form was significantly higher in the tonsillectomized than in the nontonsillectomized group, being 18.6 and 7.5 per cent, respectively. On the other hand, the proportion of cases of nonparalytic poliomyelitis was slightly, but not significantly, greater in the group with tonsils intact. The differences in the proportions of cases of the spinal forms of poliomyelitis were likewise not significant (table 4). The major cause of death was respiratory failure resulting from involvement of the bulbar nuclei. Since the majority of patients with the bulbar form

had been tonsillectomized (table 4), it was not surprising that the mortality among them was higher than among the children with intact tonsils. Thus, in the tonsillectomized group 15, or 6.5 per cent, of the patients died, as compared with only 4, or 1.5 per cent, of the patients whose tonsils had not been removed.

Interval After Tonsillectomy in Relation to Type of Poliomyelitis.—It was found that the proportion of cases of bulbar poliomyelitis was

TABLE 4.—*Type of Poliomyelitis Occurring in Children Between the Ages of 3 and 12 Years With and Without Tonsils and Adenoids in Toronto During 1937*

Type of Poliomyelitis	Total		Patients with Tonsils and Adenoids Absent		Patients with Tonsils and Adenoids Present		No Information
	Number	Percentage	Number	Percentage	Number	Percentage	
Nonparalytic	256	50.5	108	46.8	141	52.8	7
Bulbar	63	12.4	43	18.6	20	7.5	..
Involving upper part of spinal cord	94	18.5	45	19.5	49	18.4	..
Involving lower part of spinal cord	167	32.9	69	29.9	96	36.0	2

Patients with multiple involvement were tabulated according to each type of poliomyelitis which they presented.

TABLE 5.—*Relation of Type of Poliomyelitis to Interval Between Removal of Tonsils and Adenoids and Onset of the Disease in Children Between the Ages of 3 and 12 Years in Toronto During 1937*

Interval, Months	All Types	Type of Poliomyelitis				Died
		Non-Paralytic	Bulbar	Involving Upper Part of Spinal Cord	Involving Lower Part of Spinal Cord	
Less than 1	8	2	4	1	1	..
1 to 2	15	6	2	3	5	1
2 to 6	16	9	1	..	6	..
6 or over	192	91	36	41	57	14
	231	108	43	45	69	15

Patients with multiple involvement were tabulated according to each type of poliomyelitis which they presented.

higher and that of the nonparalytic form lower among those tonsillectomized within a month of onset than among those operated on more than a month prior to the onset of poliomyelitis. Furthermore, comparison with table 4 shows that the percentage of cases of bulbar poliomyelitis was uniformly higher among the tonsillectomized patients than among those with tonsils intact, except in the small group tonsillectomized two to six months before the onset of poliomyelitis (table 5).

A résumé of the data on the 8 Toronto patients in whom poliomyelitis developed within a month of tonsillectomy is given in table 6. This table includes also the facts on 4 nonresident children (cases 9, 10, 11 and 12) in whom poliomyelitis developed within a month of operation

and who were treated in Toronto hospitals during the epidemic. Data on these 4 children were omitted from the other tables, because we included only residents of Toronto in our study. One of these was operated on in the city and was taken home, only to return with poliomyelitis nine days later. Three of these 4 patients had the bulbar form of the disease, and 2 of them died. Abstracts of the case histories of these 12 patients follow.

REPORT OF CASES

CASE 1.—A. W., a girl aged 8 years, had her tonsils and adenoids first removed in 1934. On Sept. 3, 1937 headache, vomiting, drowsiness and pain over

TABLE 6.—*Data on Twelve Children in Whom Poliomyelitis Developed Within Thirty Days After Removal of Tonsils and Adenoids*

Case No.	Patient*	Age, Year	Date of Operation	Date of Onset of Poliomyelitis	Interval, Days	Type of Poliomyelitis
			Toronto Children			
1	A. W.	8	Sept. 11	Sept. 18	7	Nonparalytic
2	F. F.	8	Sept. 1	Sept. 9	8	Bulbar
3	H. F.	3	July 22	Aug. 1	10	Bulbar-spinal
4	P. R.	3	Aug. 4	Aug. 15	11	Involving lower part of spinal cord
5	G. McQ.	8	Aug. 18	Aug. 30	12	Bulbar
6	B. B.†	7	Sept. 8	Sept. 22 or 29	14 or 21	Involving lower part of spinal cord
7	D. S.	7	Aug. 20	Sept. 6	17	Nonparalytic
8	J. D.	6	Aug. 31	Sept. 22	23	Bulbar
			Children from Outside Toronto			
9	G. F.	5	Sept. 10	Sept. 13	3	Nonparalytic
10	R. B.†	7	Aug. 6	Aug. 14	8	Bulbar ‡
11	J. McD.	3	Aug. 12	Aug. 21	9	Bulbar
12	D. B.†	6	Aug. 4	Aug. 30	26	Bulbar-spinal ‡

* All patients were treated in Toronto during 1937.
† Included in the report of the epidemic by the Department of Health, Province of Ontario, March 1938.
‡ Died.

the neck and back developed. She was admitted to the Hospital for Sick Children the following day. She was afebrile, and physical examination was negative except for slight nuchal rigidity. Lumbar puncture on September 4 and 5 showed no abnormality of the spinal fluid. On September 11 secondary adenoidectomy was performed, and three days later, on September 14, she was discharged. On September 19 the child was brought back to the hospital because of rigid neck and fever. Examination of the spinal fluid disclosed 250 cells per cubic millimeter. The diagnosis was acute anterior poliomyelitis. Paralysis did not develop during her stay in the hospital or subsequently at home.

CASE 2.—F. F., a boy aged 8 years, underwent tonsillectomy and adenoidectomy on Sept 1, 1937, at St. Mary's Hospital. Eight days later, on September 9, he complained of headache and hiccup. On September 13 he regurgitated food through his nose. On September 15 he was admitted to the Riverdale Isolation Hospital.

His temperature was 102 F. A nasal quality of the voice and inability to swallow were noted. Examination of the spinal fluid disclosed 22 monocytes per cubic millimeter, and the reaction to the Pandy test was positive (1+). The temperature dropped to normal the following day. On discharge, October 2, mild palatal paralysis was still present. The final diagnosis was bulbar poliomyelitis, with paralysis of the palate and the muscles of deglutition.

CASE 3.—H. F., a girl aged 3 years, underwent tonsillectomy and adenoidectomy on July 22, 1937, at the Hospital for Sick Children. Ten days later, on August 1, she began to feel drowsy, had fever and was unable to swallow. On August 5 she was admitted to the hospital, with a temperautre of 103.8 F. She was irritable and drowsy, and on each examination of her throat a large amount of mucus welled up. Many rales and rhonchi were heard over the right side of her chest. Nuchal rigidity and muscular weakness were noted. The following day her temperature dropped to normal, but she continued to be drowsy for several days. On August 10 weakness in the lower extremities was noted. Neurologic examination on August 18 showed paralysis of the right leg and paresis of the left leg. The spinal fluid on August 20 showed 15 cells per cubic millimeter. The final diagnosis was bulbospinal type of poliomyelitis.

CASE 4.—P. R., a girl aged 3 years, underwent tonsillectomy and adenoidectomy on Aug. 4, 1937, at a physician's office. On August 15 she became ill. Two weeks later it was noted that she had paralysis of the right leg, and a diagnosis of poliomyelitis was made. Further details in this case were not available.

CASE 5.—G. McQ., a boy aged 8 years, underwent tonsillectomy and adenoidectomy on Aug. 18, 1937, at the East General Hospital. Twelve days later, on August 30, headache, fever and drowsiness developed. The next day he vomited and had difficulty in speaking, and he was admitted to the Hospital for Sick Children. He was acutely ill, with a temperature of 103 F. Dysarthria, dysphagia and weakness of the right side of the face were noted. The spinal fluid contained 100 cells per cubic millimeter, of which 95 per cent were monocytes. The temperature returned to normal on September 2. The dysphagia gradually subsided, but the dysarthria and facial weakness persisted up to the time of discharge. The final diagnosis was bulbar poliomyelitis, with paralysis of the muscles of the palate, the pharynx and the right side of the face.

CASE 6.—B. B., a boy aged 7 years, had his tonsils and adenoids removed on Sept. 8, 1937, at the Victoria Memorial Hospital. On September 22 he had a slight cold. On September 29 he awoke with a rigid neck and therefore was referred to the Riverdale Isolation Hospital. He had a temperature of 101.4 F., appeared acutely ill and had a fine tremor of the hands. The Kernig sign was present. Examination of the spinal fluid revealed 143 cells per cubic millimeter. No weakness or paralysis was noted. The temperature dropped to normal three days after admission. On discharge, weakness of the left arm was present. The final diagnosis was acute anterior poliomyelitis, with paresis of the left arm.

CASE 7.—D. S., a girl aged 7 years, had tonsillectomy and adenoidectomy performed on Aug. 20 1937, at the East General Hospital. Seventeen days later, on September 6, headache, nausea, vertigo and fever developed. On September 7 she had a stiff neck and was admitted to the Hospital for Sick Children. She was acutely ill, with a temperature of 101 F. There was slight rigidity of the neck. The spinal fluid contained 150 cells per cubic millimeter, 80 per cent of which were

monocytes. No weakness or paralysis was present, and none developed. The temperature dropped gradually and was normal three days after admission. She was discharged with the diagnosis of nonparalytic poliomyelitis.

CASE 8.—J. D., a girl aged 6 years, underwent tonsillectomy and adenoidectomy on Aug. 31, 1937, at a physician's office. On September 22 she had fever and felt drowsy. During the next two days she vomited, and sore throat, double vision and rigid neck developed. On September 25 she began to have difficulty in swallowing and was admitted to the Hospital for Sick Children. The spinal fluid contained 110 cells per cubic millimeter. The fever and dysphagia persisted for ten days. No other weakness or paralysis was noted. The diagnosis was bulbar poliomyelitis, with pharyngeal paralysis.

CASE 9.—G. F., a boy aged 5 years, had his tonsils and adenoids removed at a physician's office on Sept. 10, 1937. He was admitted to the Hospital for Sick Children on September 18 because of fever, malaise, headache, drowsiness and pain in the back, which developed three days after the operation. He had a temperature of 104 F. His neck was rigid. The condition of the cranial nerves, the motor power and the reflexes were within normal limits. The spinal fluid had 75 cells per cubic millimeter, 50 per cent of which were monocytes. The temperature dropped to normal in forty-eight hours. No weakness or paralysis developed. The final diagnosis was nonparalytic poliomyelitis.

CASE 10.—R. B., a boy aged 7 years, underwent tonsillectomy and adenoidectomy on Aug. 6, 1937, at the Royal Victoria Hospital. On August 14 he had fever and vomited. The next day difficulty in swallowing and then weakness of the right side of the face were noted. On August 18 he was admitted to the Riverdale Isolation Hospital, critically ill, with a temperature of 101.4 F. and a respiratory rate of 60 per minute. Paralysis of the soft palate and the pharynx and nystagmus were recorded. The following day his respirations became labored and he died of respiratory failure, thirty-six hours after admission. The diagnosis was bulbar poliomyelitis.

CASE 11.—J. McD., a boy aged 3 years, underwent tonsillectomy and adenoidectomy on Aug. 12, 1937, at the Hospital for Sick Children. On August 21 headache and drowsiness developed, followed by difficulty in swallowing. He was readmitted August 22, acutely ill, with a temperature of 102 F. The gag reflex was diminished. No other weakness or paralysis was noted. The spinal fluid contained 135 cells per cubic millimeter, of which 90 per cent were monocytes. The temperature dropped to normal three days after admission, and the dysphagia gradually disappeared. The final diagnosis was bulbar poliomyelitis, with paralysis of the pharyngeal muscles.

CASE 12.—D. B., a boy aged 6 years, underwent tonsillectomy and adenoidectomy on Aug. 4, 1937, in a physician's office. On August 30, he felt ill, and the next day fever and nuchal pain developed. On September 3 he was admitted to the Hospital for Sick Children, critically ill, with a temperature of 102 F., cyanosis and marked respiratory distress. Tremors of the tongue and jaw, partial paralysis of the intercostal muscles and weakness of the diaphragm and arms were noted. He was placed in a respirator, which gave temporary relief, but his condition became progressively worse and he died on September 5. The diagnosis was acute anterior poliomyelitis, with involvement of the bulb and upper part of the spinal cord.

II. INCIDENCE OF TONSILLECTOMY BEFORE AND DURING EPIDEMIC AND RELATION TO INCIDENCE OF POLIOMYELITIS

The other part of our investigation was an attempt to determine whether poliomyelitis was more frequent among recently tonsillectomized children than among all other children. The method used in this part of study entailed: (1) an estimate of the average number of tonsillectomized children in Toronto who were exposed to poliomyelitis within the arbitrarily set period of within one month of operation, an estimate which required the acquisition of data on the number of children tonsillectomized prior to and during the epidemic; (2) computation of the poliomyelitis rate, of all types and of the bulbar form, in this recently tonsillectomized group; (3) an estimate of the poliomyelitis rate in children of school age, excluding those recently tonsillectomized, and (4) computation of the expected number of cases of poliomyelitis in the recently tonsillectomized group on the basis of the poliomyelitis rate in all other children.

With the cooperation of the Toronto school and health authorities, in the fall of 1939, requisite information about whether the tonsils had been removed and the date of the operation was collected for a large proportion of the Toronto elementary school children, including those in public and separate (parochial) schools. A form, reproduced here, was distributed by teachers in all the classes of alternate schools. These schools,

DEPARTMENT OF PUBLIC HEALTH
City of Toronto

....
Surname Given Name Address

School.....Room No.....Age.....

.....

To the Parent or Guardian:

To complete our records we wish to get certain information about the removal of tonsils among school children.

You are asked to answer the following questions and to return this sheet promptly to your child's teacher.

1. Have his (or her) tonsils been removed? Yes or No.....
2. Date ....
   Day Month Year
3. Where: Name of Hospital.....
4. By Whom: Name of private physician.....
   Note: Please give exact information.

GORDON PARK JACKSON, M.B., D.P.H.
Medical Officer of Health

which contained 63 per cent of the Toronto elementary school population, were selected by the public health officials in order to get a good cross section of the school population. In the case of kindergarten and first

grade pupils, the forms were sent home for the parents to fill out. In the other grades, the forms were given only to the children who stated that they had undergone tonsillectomy. The Toronto officials who conducted this part of the work assured us that in their judgment the completed questionnaires indicated substantially all the tonsillectomies that had been performed on the population surveyed. Inevitably, there were some omissions, but their number is believed to be too small to influence the results we have obtained.

The figures obtained from the survey were subject to certain adjustments, as follows:

1. Since statements as to time in medical histories are frequently incorrect, sometimes by a wide margin, even with respect to information given on young children, for whom the margin of error would seem to be slight, it was thought necessary to verify with the surgeon or the hospital the date of every tonsillectomy reported as being performed just prior to or during the major part of the epidemic period, namely from July to September 1937. It is readily understood that this procedure revealed only those errors in which the tonsillectomy had incorrectly been reported as being performed in these months and not those errors in which operations done in these months had incorrectly been reported as occurring at other dates. Analysis of the errors of tonsillectomies incorrectly reported as having been done during the epidemic period, however, permitted us to make suitable allowance for the tonsillectomies incorrectly reported as performed outside this period. In most instances the margin of error was not more than two or three months. There was a significant number of cases, however, in which the year was given incorrectly. The tendency was to report the date of the operation as later than it actually was. On the other hand, the more recent the operation the greater was the accuracy of the statement, and in the adjustment of the data this was taken into consideration.

2. For a sizable number of tonsillectomies the month in which the operation was performed was not reported. We have assumed that these tonsillectomies were distributed in the same proportion as those for which the month was stated.

3. The elementary school population did not include all children of school age, partly because of delayed registration of younger children and partly because of the graduation to secondary schools of brighter children of the upper age groups. The numbers of children reported at the yearly age levels between 7 and 12 were taken as corresponding to the population. The age levels for which the number of children reported was considered deficient were 5, 6, 13 and 14 years. Our figures have been adjusted, therefore, to make allowance for the deficiencies at these age levels. In correcting the figure for any age level considered deficient, age 12 was taken as a standard, and the school

census figure at that age level was multiplied by the ratio of births in Toronto during 1926-1927 (the birth years corresponding to age 12) to the births during the birth years corresponding to the age which was deficient in the school census.[5] Thus,

$$\text{Population at age 6} = \text{school census at age 12} \times \frac{\text{mean number of births 1932-1933}}{\text{mean number of births 1926-1927}}$$

This method gives, of course, only an approximation, but it is sufficiently accurate for our purposes, in the absence of actual data. No adjustment was deemed necessary for those not attending school because of illness or for those receiving their education at home or in private schools. The number of such children were too small to be of any significance.

4. In computing the rates of occurrence of poliomyelitis among children excluding those recently tonsillectomized, allowance has been made for the fact that many children were away from the city during all or part of the vacation period. Because of the epidemic many parents probably kept the children away longer than usual. On the other hand, the disease was prevalent throughout Ontario, and many Toronto children who contracted poliomyelitis while away on vacation were brought to the city for treatment. That, to a certain extent, was an offsetting factor. Consequently, a 10 per cent deduction from the population of school age was thought to be a reasonable allowance for those away on vacation.

The number of tonsillectomies was estimated for each month separately. We have defined recent tonsillectomies as those performed within one month of the onset of poliomyelitis. This convenient time interval covers the period during which healing of the operative area is completed as well as the incubation period of poliomyelitis. Now, data to be presented show that tonsillectomies were done much more frequently in the early part of the summer than in midsummer and early fall (table 7), while the peak of the epidemic came in late summer (table 2). Consequently, the majority of those tonsillectomized during early summer were no longer in the recently tonsillectomized group when the epidemic was at its height, because by that time more than one month had elapsed since the operation.

It was necessary then to estimate as closely as practical, and on a comparable basis, the total time during which (*a*) the recently tonsillectomized group and (*b*) the rest of the school population were exposed to poliomyelitis. The latter group corresponds closely with the actual population (excluding those recently tonsillectomized and exposed within a month) adjusted for vacation absences as previously described, and

5. Further adjustment of these figures might have been made to allow for the mortality between the "deficient" ages and age 12, but the mortality in this period of life is so low that the additional adjustment is really unnecessary.

consequently these numbers were used. For the former group, it would be technically most accurate to determine the actual units of exposure to risk in shorter periods than a month.[6] We have not chosen a shorter interval because precise facts as to the date of all tonsillectomies performed during the period would be required, and this would have entailed more work than would be commensurate with the accuracy obtained, the more so since the actual number of cases of poliomyelitis in the tonsillectomized group was relatively small. A sufficiently good approximation was obtained by making calculations for each month of the epidemic period separately.

The average number of recently tonsillectomized children exposed during an entire month did not consist simply of those tonsillectomized during the month but, with the exception of July, was approximately the mean of the number tonsillectomized in a particular epidemic month

TABLE 7.—*Reported and Estimated Incidence of Tonsillectomy and Estimated Incidence of Exposure Among Those Tonsillectomized in Elementary School Children Between the Ages of 3 and 12 Years* in Toronto During Four Months of 1937*

Month of 1937	Number Reporting Tonsillectomy	Estimated Total Number Undergoing Tonsillectomy	Estimated Number Undergoing Tonsillectomy Exposed to Poliomyelitis
July	409	738	369
August	343	570	654
September	167	288	429
October	140	236	262

* The children were between the ages of 5 and 14 years at time of reporting tonsillectomy.

and in the month preceding. Thus, the number of children exposed in August was the total number exposed during July and August divided by 2 (table 7). It is readily seen that all of those operated on in August were exposed in that month but for only part of the month. For example, those operated on on August 31 were exposed for only one day in that month. In like manner, those operated on on July 31 were exposed for thirty days in August. Since the epidemic did not begin until late in July, we have excluded from consideration the tonsillectomies performed during June. The average number of children exposed in July was approximately one half of those tonsillectomized in that month.

ANALYSIS OF DATA

The number of tonsillectomized children in the observed sample population and the estimated figures for the total number undergoing

6. A rough test was actually made, based on the numbers exposed in each week of the epidemic, and this indicated an even more striking contrast between the recently tonsillectomized children and the rest of the population of school age.

tonsillectomy and the number of tonsillectomized children exposed to poliomyelitis for the entire population during four specified months are shown in table 7.

The incidence of poliomyelitis, of all forms and of the bulbar form, in the recently tonsillectomized group is given in table 8. These rates are based on the number exposed, as already described. No cases of poliomyelitis were recorded in July and October in this group. While the numbers in each of the other two months are small, it is notable that both the number and the rate were highest in September.

TABLE 8.—*Incidence of Poliomyelitis Among Recently Tonsillectomized Children Who Were Between the Ages of 3 and 12 Years in Toronto During 1937*

Month	Estimated Number of Children Exposed	Number of Cases of Poliomyelitis		Incidence of Poliomyelitis per 1,000 Children	
		All Types	Bulbar Type	All Types	Bulbar Type
July	369	0	0	0	0
August	654	3	2	4.6	3.1
September	429	5	2	11.7	4.7
October	262	0	0	0	0

TABLE 9.—*Incidence of Poliomyelitis Among Children Not Recently Tonsillectomized Who Were Between the Ages of 3 and 12 Years in Toronto During 1937*

Month	Estimated Number of Children Exposed*	Number of Cases of Poliomyelitis		Incidence of Poliomyelitis per 1,000 Children	
		All Types	Bulbar Type	All Types	Bulbar Type
July	84,315	8	0	0.1	0
August	84,058	228	27	2.7	0.3
September	84,261	225	28	2.7	0.3
October	84,411	33	4	0.4	†

* After deduction of 10 per cent for vacation absences from city.
† Less than 0.05.

The incidence of poliomyelitis in the entire population between the ages of 3 and 12 years, excluding those recently tonsillectomized, is shown in table 9. Low rates are recorded, both in July and October. The rates for August and September are identical, both for total number of cases of poliomyelitis and for the number of cases of the bulbar form, namely 2.7 and 0.3 cases per thousand, respectively, in each month.

Comparison of tables 8 and 9 shows that except in July and October, when the general incidence of poliomyelitis was low, the rates among the recently tonsillectomized children were much higher than among other children. In August the rate for the total number of cases of poliomyelitis of the former group was nearly twice that of the other children and in September was about four times as high.

On the basis of the attack rates for the general child population between the ages of 3 and 12 years, the expected incidence of poliomyelitis, both of all forms and of the bulbar form, was computed for the recently tonsillectomized children. The comparison of the expected and the actual incidence for each of the chief epidemic months is shown in table 10. It will first be noted that the actual number of cases in the recently tonsillectomized children totaled 8, as compared with only 4.5 expected. As for bulbar poliomyelitis, not a single case would be expected in a group the size of the recently tonsillectomized group, the computed figure being 0.3 case, as compared with 4 cases actually occurring. The number of cases of nonbulbar poliomyelitis expected is approximately 4, as compared with 4 actually occurring. Consequently, the high incidence of poliomyelitis in the recently tonsillectomized group

TABLE 10.—*Actual and Expected Incidence of Poliomyelitis Among Recently Tonsillectomized Children Between the Ages of 3 and 12 Years in Toronto During 1937*

Month	Incidence of Poliomyelitis			
	All Types		Bulbar Type	
	Actual Number of Cases	Expected Number of Cases*	Actual Number of Cases	Expected Number of Cases
July	0	0.7	0	0
August	5	1.8	2	0.2
September	3	1.2	2	0.1
October	0	0.8	0	0
Total	8	4.5	4	0.3

* On basis of actual incidence in other groups of children.

is practically accounted for by the excess of cases of the bulbar form of the disease.

COMMENT

A large localized outbreak of poliomyelitis occurred in Toronto and in the province of Ontario in 1937. The excellent records kept by the authorities in charge made it possible to review the cases occurring in Toronto in the epidemic, with special reference to a history of previous tonsillectomy and the date of such operation. The case records of the epidemic period were supplemented by our direct investigation whenever it was necessary to complete the case history.

The first part of this study entailed the collection of data on 507 patients with poliomyelitis 3 to 12 years old at the time of the 1937 Toronto epidemic. The patients were classified as tonsillectomized and nontonsillectomized, and the two groups were analyzed according to the month of occurrence, the age at time of onset, the type of and the

mortality from poliomyelitis and the relation of the length of the interval between tonsillectomy and onset of the disease to the type of poliomyelitis.

It was found that poliomyelitis took the bulbar form in the largest proportion of those patients in whom the disease developed within one month after tonsillectomy, namely in 7 of 12 patients treated for poliomyelitis in Toronto (in 4 of 8 children residing in Toronto and in 3 of 4 children residing outside of Toronto). Moreover, the percentage of cases of the bulbar form among the children with poliomyelitis who had a history of tonsillectomy, regardless of when performed, was over twice as high as that in the nontonsillectomized children with the disease, 18.7 and 7.5 per cent, respectively. This difference is in conformity with the statistics on types of poliomyelitis in the series reported by Eley and Flake.[7] Their figures showed that the bulbar form developed in 46.9 per cent of the children with poliomyelitis whose tonsils had been removed in the past, as compared with only 17.9 per cent of those with tonsils intact. When the tonsillectomized patients were classified in two groups, those recently operated on and those operated on more than thirty days before the onset of poliomyelitis, the proportions of cases of the bulbar form among them were 68.0 and 43.9 per cent, respectively. Their patients were all hospitalized, and the higher proportion of cases of the bulbar form may well be explained, as they stated, by the fact that patients with this form of the disease cause greater concern and therefore are more frequently referred to the hospital.

In the second part of our study, with the cooperation of public health and school officials, a large sample of the school population was surveyed to obtain information on the general incidence of tonsillectomy. The facts collected showed the actual numbers of school children in the sample who had been tonsillectomized at any time and the date of the operation in each case. From these data, it was possible to compute the incidence of poliomyelitis during the 1937 epidemic among recently tonsillectomized children who were residents of Toronto.

This part of the present study showed a higher incidence of poliomyelitis in the recently tonsillectomized group than among other children, but since the total number of cases of poliomyelitis in the tonsillectomized group was only 8, a number too small to give a statistically significant difference, the result by itself cannot be considered conclusive. The frequent reports, in late years, of the occurrence of poliomyelitis in recently tonsillectomized children does, however, give us some confidence in the significance of the present study.

7. Eley, R. C., and Flake, C. G.: Acute Anterior Poliomyelitis Following Tonsillectomy and Adenoidectomy with Special Reference to the Bulbar Form, J. Pediat. **13**:63 (July) 1938.

Certain phases of the situation call for consideration in judging the validity of the results, apart from the statistical significance of the difference between the incidence among the recently tonsillectomized children and that among other children. First, there is the possibility that these children tonsillectomized just prior to or during the epidemic acquired poliomyelitis in the hospital. Great care was taken, however, particularly during the height of the epidemic, to avoid such a situation. It was found, moreover, that only 2 of the children had been operated on by the same surgeon. In addition, only 2 children were operated on in hospitals in which patients with poliomyelitis were treated during the epidemic.

On epidemiologic grounds alone, one would not expect a higher incidence of poliomyelitis among recently tonsillectomized children than among those nontonsillectomized, because, other things being equal, there is no reason to expect any difference between the degrees of exposure of the two groups. If anything, the recently tonsillectomized children appear to be less exposed, so far as they are isolated from other children during the period of operation and convalescence. The higher incidence of poliomyelitis among the recently tonsillectomized children, therefore, suggests a lowered resistance to the disease. The mechanism of this lowered resistance is not altogether clear, but probably is related either to the portal of entry of the disease or to the avenue of its spread. The route by which the virus enters the body has not been definitely determined. This study, along with others of the same type, suggests that traumatized adenoid and tonsillar tissue may afford the portal of entry for the virus in some cases. In an earlier paper [3] a discussion of the physiologic basis of this theory was presented.

The higher incidence of poliomyelitis with bulbar involvement among children whose tonsils have been removed at any time previous to the attack of the disease also indicates the possibility that the tonsillopharyngeal area is one of the portals of entry and that the tonsils and adenoids serve as a barrier. When they are removed, patients in whom poliomyelitis develops are more susceptible to the bulbar type of the disease. Our data confirm our previously expressed opinion [8] that tonsillectomy and adenoidectomy had best be postponed while poliomyelitis is prevalent in the community.

CONCLUSIONS

Among children between the ages of 3 and 12 years in the Toronto epidemic of 1937, acute poliomyelitis developed more often in those recently tonsillectomized than in others.

The increased incidence was due entirely to the excess of cases of the bulbar form.

Among the children with poliomyelitis, the incidence of the bulbar form was more than twice as great in those whose tonsils had been removed at any time previously as in those with tonsils intact.

Drs. G. P. Jackson, L. A. Pequegnat and E. Laxton and Mr. E. Ashton, of the Toronto City Department of Health; Misses Elsie Hickey and Zeda Keefer and their staff, of the Toronto City Public Health Nurses; Dr. J. T. Phair, Deputy Minister of the Department of Health of the Province of Ontario; Drs. Alan Brown and F. F. Tisdall, of the Hospital for Sick Children; Dr. Beverley Hannah, of the Riverdale Isolation Hospital; Dr. R. D. Defries, of the University of Toronto, and Dr. N. L. Burnette, of the Metropolitan Life Insurance Company of Ottawa, Canada, cooperated in this study.

Since our paper was submitted for publication, F. H. Top and H. F. Vaughan, at a meeting of the American Public Health Association, reported that in the outbreak of poliomyelitis in Detroit in 1939 bulbar paralysis developed in 4.2 per cent of nontonsillectomized patients, while it developed in 27 per cent of patients previously tonsillectomized, whether within one month, one year or over a year before the onset of poliomyelitis. They also stated that of the 521 cases (including fatal ones) of poliomyelitis reviewed, tonsillectomy had been performed in 41.3 per cent; of 23 fatal cases, in 20, or 87 per cent, tonsillectomy had been performed previous to onset of the disease.

Case Reports

MULTIPLE CYSTIC TUBERCULOSIS OF BONES

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AND
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Recently one of us (D. W. M.) [1] reported what was apparently the twelfth case of multiple cystic tuberculosis of the bones in pediatric literature. The following report brings the number of cases reported to 13.

REPORT OF CASE

I. M., a 1½ year old Negro boy, was admitted to Duke Hospital on Sept. 28, 1939 with the complaint of "boils" of nine months' duration. The family history showed that the patient was exposed to tuberculosis during the first four months of his life. The past history was irrelevant except that he had received a diet poor in vitamins. The present illness began in January 1939, nine months prior to admission, when a painless swelling developed on the dorsum of the right foot, which increased slowly in size and became fluctuant but never hot or inflamed. Two months later, in March, a similar swelling appeared lateral to the outer canthus of the left eye. Thereafter similar lesions appeared successively on the dorsum of the right hand, the right elbow, the right lateral malleolus and the dorsum of the left foot. The last lesion appeared two weeks before admission.

With the appearance of the second lesion, in March 1939, these swellings were repeatedly incised and drained. Throughout the present illness the patient had intermittent fever. There was no history of cough, night sweats or hemoptysis.

Physical Examination.—The temperature was 37.4 C. (99.3 F.), the respiration rate 20 per minute and the weight 7,070 Gm. The patient was chronically ill and malnourished. His skin was dry and inelastic. The left posterior cervical, left submaxillary, right and left epitrochlear, left femoral and right femoral nodes were enlarged. The anterior fontanel was patent and deeply sunken. Lateral to the outer canthus of the left eye there was a swelling, 2 cm. in diameter, from which drained thick, yellow-green pus through a sinus opening, 2 mm. in diameter (fig. 1). On the right elbow was a large fusiform swelling (fig. 1). The right ring finger at the proximal phalanx was three times its normal size, and on it in ring distribution were three irregularly shaped ulcers. There was fusiform swelling of the right foot, with no similar ulcers (fig. 2). On the third toe of the left foot were two small ulcers. All the lesions had granulating bases. The remainder of the physical examination revealed nothing of significance.

From the Department of Pediatrics of Duke University School of Medicine and Duke Hospital.

1. Martin, D. W.: Multiple Cystic Tuberculosis of Bones: Report of Case, J. Pediat. **15**:254-257 (Aug.) 1939.

Accessory Clinical Data.—The hemoglobin content was 7 Gm. (45 per cent, Sahli); the red cell count was 4,000,000, with marked central achromia; the white cell count was 15,720, with 61 per cent polymorphonuclear cells, 32 per cent small lymphocytes, 5 per cent large lymphocytes and 2 per cent monocytes. Urinalysis showed a specific gravity of 1.020, with 8 white blood cells per high

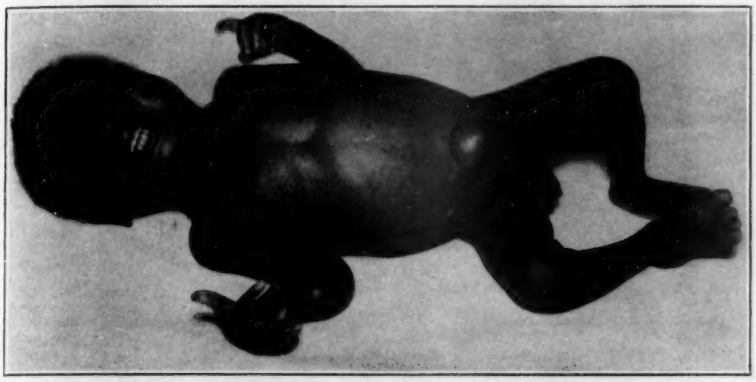

Fig. 1.—Photograph showing the swelling and draining sinus lateral to the left eye and the fusiform swelling of the right elbow and the dorsum of the right foot.

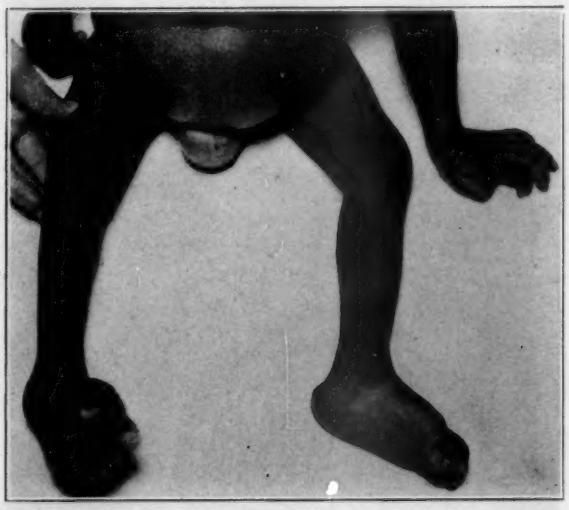

Fig. 2.—Photograph showing swelling and ulceration on the dorsum of the right foot.

power field. The results of tests for sugar, albumin and Bence Jones protein were negative. Tubercle bacilli were found in the gastric washings; the intradermal tuberculin test (0.00001 mg.) gave a 3 plus reaction. The Wassermann reaction was negative; serum calcium was 9.5 mg. and serum phosphorus 5.1 mg. per hundred cubic centimeters; serum phosphatase was 7.8 Bodansky units.

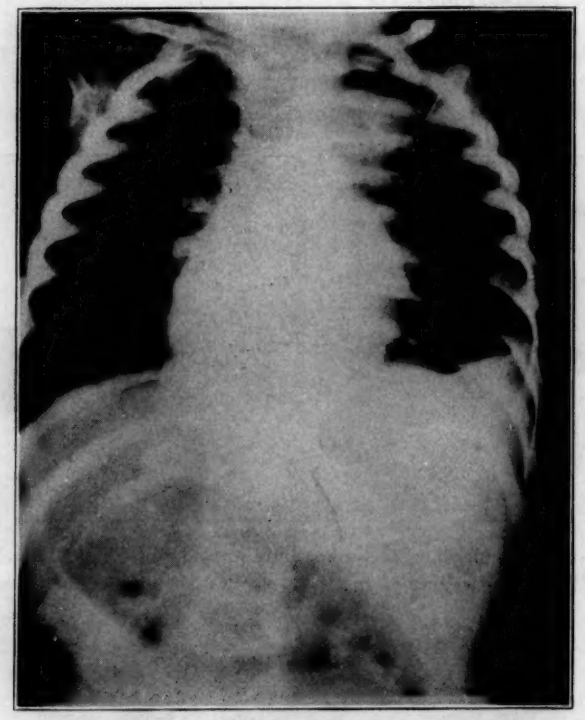

Fig. 3.—Roentgenogram of the chest showing infiltration in the upper lobe of the left lung.

Fig. 4.—Roentgenogram of the skull showing punched-out lesions in the frontal and temporal bones.

Roentgen Examination.—Examination of the chest showed extensive tuberculosis (fig. 3), with a small effusion at the base of the right lung. In the skull, there were cystic areas of destruction in both frontal bones and in the left temporal

Fig. 5.—Roentgenograms of the right arm showing cystic lesions in the olecranon, with associated periostitis, and complete destruction of the proximal phalanx of the fourth finger.

Fig. 6.—Roentgenograms showing complete destruction of the first metatarsal bone of the right foot and of the proximal phalanx of the third toe of the left foot.

bone (fig. 4). In the right elbow there were destructive changes in the olecranon and periostitis (fig. 5). The proximal phalanx of the fourth finger of the right hand was completely destroyed. The first metatarsal bone of the right foot and

the proximal phalanx of the third toe of the left foot showed almost complete destruction (fig. 6). In the right tenth rib was an area of destruction, 2 cm. from the vertebral articulation.

COMMENT

This case is similar to the one recently reported from this hospital and to those reviewed by Law and Perham.[2] However, the number and extent of the lesions seem to be much greater than in cases previously reported. The wide dissemination of the lesions in these cases of multiple cystic tuberculosis of the bones makes one comparatively certain that the tubercle bacilli have been spread through the blood stream. Law and Perham [2] suggested that the tubercle bacilli localize in the metaphyses of the bones because of the anatomic situation of the end arteries; however, it is difficult to explain on that basis the lesions in the skull found in this case. Many workers are of the opinion that there is always an infection of the blood stream when primary tuberculous infection occurs and that the lesions in the bones and viscera are overcome and heal, as do the majority of pulmonary lesions of the primary type. One might postulate that in cases of multiple cystic tuberculosis of the bones the tubercle bacilli reach the lungs through the nose and mouth and then spread by the lymphatics to the blood stream and throughout the body but cause demonstrable lesions only in the bones in which the local resistance has been lowered, owing to previous injury, decalcification or rickets. When a sufficient number of tubercle bacilli localize in the bone the process of caseation proceeds more rapidly than the process of repair; therefore cystic lesions develop or there may be complete destruction of smaller bones.

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2. Law, J. L., and Perham, W. S.: Multiple Cystic Tuberculosis of Bones in Children, Am. J. Dis. Child. **56**:831-845 (Oct.) 1938.

JUVENILE AMAUROTIC FAMILY IDIOCY

SIX CASES OF ITS OCCURRENCE IN SIBLINGS

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Few degenerative diseases of the nervous system have received wider attention than amaurotic family idiocy (Tay-Sachs disease). The condition was believed at first to be limited to early infancy, but cases occurring in late infancy, in adolescence and even in adult life have been reported in increasing numbers. A characteristic type of this disease occurs in children between the ages of 5 and 15 years and is termed, accordingly, juvenile amaurotic family idiocy, or the "Spielmeyer-Vogt type," since isolated cases were described by Spielmeyer,[1] in 1908, and by Vogt,[2] in 1906, although Batten [3] first recognized the disease in 1903. In 1931 an extensive report on the clinical and genetic aspects of juvenile amaurotic family idiocy was published by Sjögren,[4] whose material included 59 affected families observed in Sweden; the pathologic features of these cases were later reported on by Sjöval and Ericsson.[5]

Although numerous reports of cases of the infantile type of Tay-Sachs disease can be found in the American literature, few cases of the juvenile type have been reported in this country (Hershey,[6] Ornsteen,[7] Arnold and associates [8] and FitzJerrel and Neuchiller [9]), and in only 1 of

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From the Department of Neuropathology, New York State Psychiatric Institute and Hospital.

1. Spielmeyer, W.: Klinische und anatomische Untersuchungen über eine besondere Form von familiärer amaurotischer Idiotie, in Nissl, F., and Alzheimer, A.: Histologie und Histopathologie Arbeiten über die Grosshirnrinde, Jena, Gustav Fischer, 1908, vol. 2, p. 193.

2. Vogt, H.: Ueber familiäre amaurotische Idiotie und verwandte Krankheitsbilder, Monatschr. f. Psychiat. u. Neurol. **18**:161, 1906.

3. Batten, F. E.: Cerebral Degeneration with Symmetrical Changes in the Maculae in Two Members of a Family, Tr. Ophth. Soc. U. Kingdom **23**:306, 1903.

4. Sjögren, T.: Die juvenile amaurotische Idiotie, Hereditas **14**:197, 1931.

5. Sjöval, E., and Ericsson, E.: The Anatomical Type of the Swedish Cases of Juvenile Amaurotic Idiocy, Acta path. et microbiol. Scandinav. **16**:460, 1933.

6. Hershey, L. M.: Two Cases of Amaurotic Family Idiocy, Juvenile Type, in a Brother and Sister, Arch. Neurol. & Psychiat. **22**:1085 (Nov.) 1929.

7. Ornsteen, A. M.: Amaurotic Family Idiocy: Report of a Case of the Juvenile Form and One of an Abortive Character, M. J. & Rec. **137**:64, 1933.

(Footnotes continued on next page)

these was the clinical diagnosis confirmed by pathologic examination.[10] It is the purpose of this paper to put on record the occurrence in a family of English-American stock of 6 cases of the disease. In addition, the pathologic findings in 1 of these cases will be described and commented on. The study of these cases may serve to supplement the few observations already published.

REPORT OF CASES

Family History.—In the paternal line the grandparents, of Scotch descent, were healthy persons, farmers, who died in old age. They had 7 children; 1 of them died of tuberculosis, at 25 years of age; the others were reported to be healthy, but no direct examination of them could be made. In the maternal line the grandparents, of Irish stock, were also healthy persons who died in old age. They had 7 children, 2 of whom died of tuberculosis, at 21 and 30 years of age, respectively. Little information concerning the other children could be secured, but they were said to be healthy persons who lived until old age. There was no consanguinity between the paternal and the maternal line.

The father, a farmer, was living and in good health. The mother, a school teacher, had died at the age of 61, of diabetes. The family of the patients consisted of 15 children, 2 girls and 13 boys. Two boys, the first and the fourth in order of birth, had died within the first six months of life, of "cholera infantum." The 2 daughters, 21 and 24 years of age, respectively, were living and healthy. One of these was married and had a healthy child, 10 years of age. Four of the sons were also living and healthy; all had graduated from high school and 2 from college; 3 were married, and each had 1 healthy child, who, however, was less than 5 years of age, that is, below the age at which juvenile amaurotic idiocy occurs.

There were 6 affected children among the 15 in the family. A brief summary of their histories will be given.

CASE 1.—Kn., a boy, the second child in order of birth, was born at full term after a normal labor. He walked at 12 months and talked at 18 months of age. Physical and mental development was normal until the age of 5 years. At this time it was noted that the child was losing interest in his surroundings and that his vision had begun to fail. Examination by several physicians showed primary optic atrophy but no other signs of organic disease of the nervous system. At that time it was suspected that the optic atrophy was toxic in origin. The patient was committed to the school for blind children at Batavia, N. Y., but shortly after was sent home because he made no progress in school. At home, although he was able to accomplish simple tasks, slowly increasing physical and mental deterioration was observed. His vision became progressively worse until, at 10 years of age, complete blindness had become established. He gradually lost

8. Arnold, G. B.; Harrell, D. L., and Riley, H.: Amaurotic Family Idiocy: Three Case Reports, Virginia M. Monthly **62**:372, 1935.

9. FitzJerrell, H. B., and Neuchiller, B. B.: Amaurotic Family Idiocy (Juvenile Form), Illinois M. J. **74**:456, 1938.

10. C. R. Tuthill (Juvenile Amaurotic Idiocy, Arch. Neurol. & Psychiat. **32**: 198 [July] 1934) described an additional case, in which, however, the condition belongs more correctly to the syndrome known as "gargoylism."

weight, during the last two years appearing extremely emaciated. At 12½ years of age he had the first of many generalized convulsive attacks. Similar attacks recurred once or twice a week until his death. During the last year of life the patient showed no signs of mental activity. He was bedridden. There was spasticity of the extremities, which were held in flexion. He died at the age of 15 years.

Case 2.—F., a girl, the third child in order of birth, had a normal history until the age of 5 years. Walking and talking were begun at the usual age. Mental development was above normal; the girl entered school at 4 years of age and at 5 years was able to read. About this time it was noted that her vision was failing slowly. She was kept in school for two more years, until the increasing visual impairment and incipient intellectual defect prevented her from continuing. At this time a diagnosis of optic atrophy was made. At 9 years of age a generalized epileptic attack was noted. A second seizure occurred one year later, after which the attacks recurred at irregular intervals, at some times twice a week, at other times twice a day. It was also noted that her mental powers were gradually deteriorating. At 10 years of age the patient was admitted to the Craig Colony for Epileptics, at Sonyea, N. Y., where blindness was found to be almost complete, the patient being able to distinguish only between light and darkness. The pupils were dilated and responded sluggishly to light. Both disks were pale, and the retinal vessels were smaller than normal. A well defined narrow ring of black pigment was observed around the entire border of the disk. During her stay at the hospital the patient's mental powers deteriorated steadily. During the two years prior to her death she was bedridden, and her life was a purely vegetative one. Convulsions became more frequent and severe. She died at the age of 16 years.

An autopsy was performed. The brain was reported as being smaller than normal and the lateral ventricles as slightly enlarged. No material was available for histologic examination.

Case 3.—Ke., a boy, the fifth child in line of birth, had a normal history up to the age of 6 years, when some impairment of vision was noted. The patient started to school at the age of 7 years, but made no progress. He was therefore kept home, where, until the age of 10, he was able to perform some simple farm work. His vision gradually became worse; at 10 years of age he could hardly distinguish between light and darkness. About this time he had the first of a series of epileptic seizures. These were rare at the beginning but later became more and more frequent. Mental and physical deterioration grew rapidly worse, and the patient died at the age of 15 years.

Case 4.—R., a boy, the tenth child in line of birth, was bright and healthy until the age of 5 years, when, like his brothers, he began to lose his eyesight. A diagnosis of primary optic atrophy was made by an ophthalmologist; this specialist made no mention of the presence of pigment in the retina. Mental backwardness became apparent at the age of 7 years and ran a slowly progressive course. Convulsions occurred at the age of 10 years. The patient died in status epilepticus at the age of 15 years.

Case 5.—A., a boy, the eleventh child in order of birth, showed visual impairment and signs of mental defect for the first time at the age of 5 years. He never attended school. Failure of vision and of intellect slowly progressed. Convulsions were observed at the age of 11 years, and, as in the other cases, they became progressively more severe and more frequent. Physical deterioration was

more striking in this patient than in the others. For over three years the boy was bedridden, extremely emaciated and in a position of forced flexion. He died at the age of 14 years.

CASE 6.—H., a boy, the fourteenth child in order of birth, showed normal development until the age of 5 years. At this time it was noticed that his eyesight was failing. Shortly after, slowly progressive mental deterioration became evident; the boy would remain for hours inattentive and passive; he was forgetful and at times had crying spells and violent outbursts of temper, during which he became assaultive and destructive. The mental condition became progressively worse, and the eyesight continued to fail. At 10 years of age he had a generalized convulsion. At 12 years of age he was admitted to St. Lawrence State Hospital. He was blind, uncooperative, noisy and destructive. During the remainder of his stay in the hospital, his mental powers gradually became more deteriorated. At the age of 13 years several generalized convulsions were again observed, four to five attacks occurring daily. Two years later he began to lose weight rapidly and died at the age of 16 years.

This case was the only one of the 6 in which material was available for histologic examination.

Autopsy.—Postmortem examination showed generalized pulmonary tuberculosis, which was given as the ultimate cause of death. No other pathologic condition was found by gross examination. The liver weighed 850 Gm. and the spleen 160 Gm. Both these organs appeared grossly normal, though unfortunately no histologic examination of them was made.

The brain was hard and smaller than normal. It weighed 1,025 Gm. The main convolutions and sulci showed no significant deviation from the normal pattern. The cerebellum appeared of normal size. The pia-arachnoid showed no gross abnormality.

Histologic Examination.—The usual neuropathologic technics were used in the examination. The methods included those of Nissl, Einarson and Beilschowsky for neuron cells; those of Spielmeyer, Weigert and Weil for myelin sheaths; those of Holzer and Cajal for neuroglia, and that of Hortega for oligoglia and microglia. In addition, several methods for staining lipids were used.

Nerve Cells: In the Nissl preparation all the nerve cells of the cerebral cortex showed striking pathologic changes (fig. 1). The cell was enlarged, pear shaped or ballooned; the cytoplasm was devoid of Nissl bodies and had a foamy aspect. Only a few pyramidal cells still contained a few Nissl bodies, generally situated at the apex of the cell. In the most affected cells varying alterations of the nucleus were also observed, ranging from pyknosis to complete destruction. The dendrites showed no swelling. Swollen cells were observed everywhere in the cerebral cortex. There were hardly any differences in the degree of cellular alteration in the different regions examined. Only a few neuron cells appeared to have escaped the swelling process; these were shrunken, the cytoplasm was uniformly and deeply stained by the thionine, and the nucleus was pyknotic.

In the Bielschowsky preparation (fig. 2) the impression of the extreme distortion of the neuron cells was confirmed, the cell body being transformed into a balloon-like formation in which the nucleus was displaced toward the periphery and the neurofibrils had disappeared. Throughout the whole cytoplasm there was a delicate argentophilic meshwork.

The destruction of numerous neurons had resulted in cytoarchitectural alterations, which varied in type and in degree. In some areas all the cortical layers were uniformly involved, resulting in diffuse rarefaction of neurons; in other

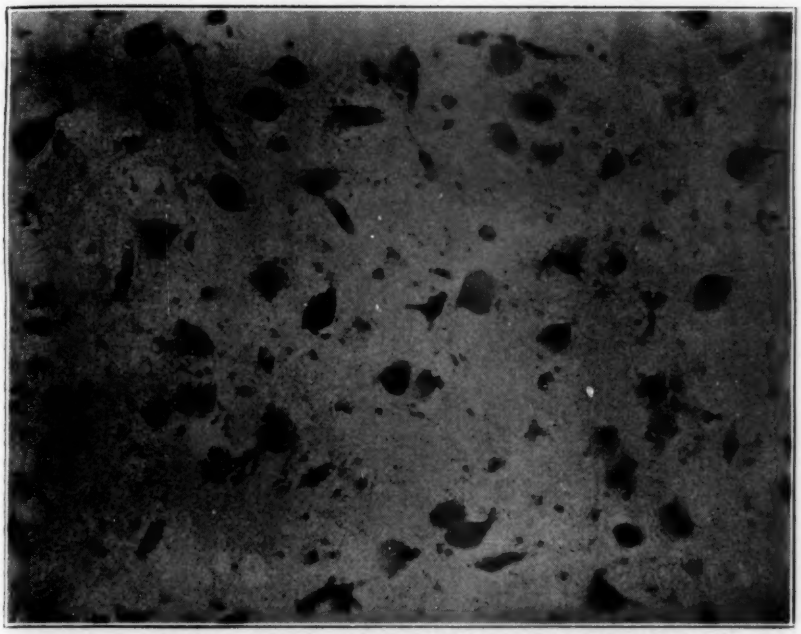

Fig. 1 (case 6).—Nissl preparation of a section from the cerebral cortex (temporal lobe), showing the characteristic swelling of neuron cells. High magnification.

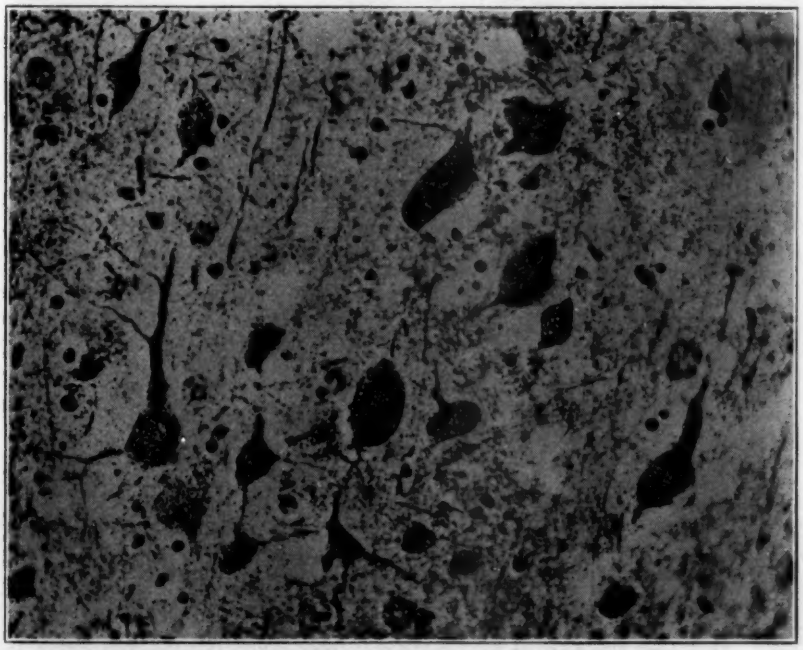

Fig. 2 (case 6).—Bielschowsky preparation of a section from the cerebral cortex (parietal lobe), showing the same characteristic swelling of the neuron cells. High magnification.

areas some cellular layers were more severely involved than others. A peculiar feature, frequently encountered, was almost complete destruction of the fifth cellular layer, the other layers being comparatively better preserved (fig. 3).

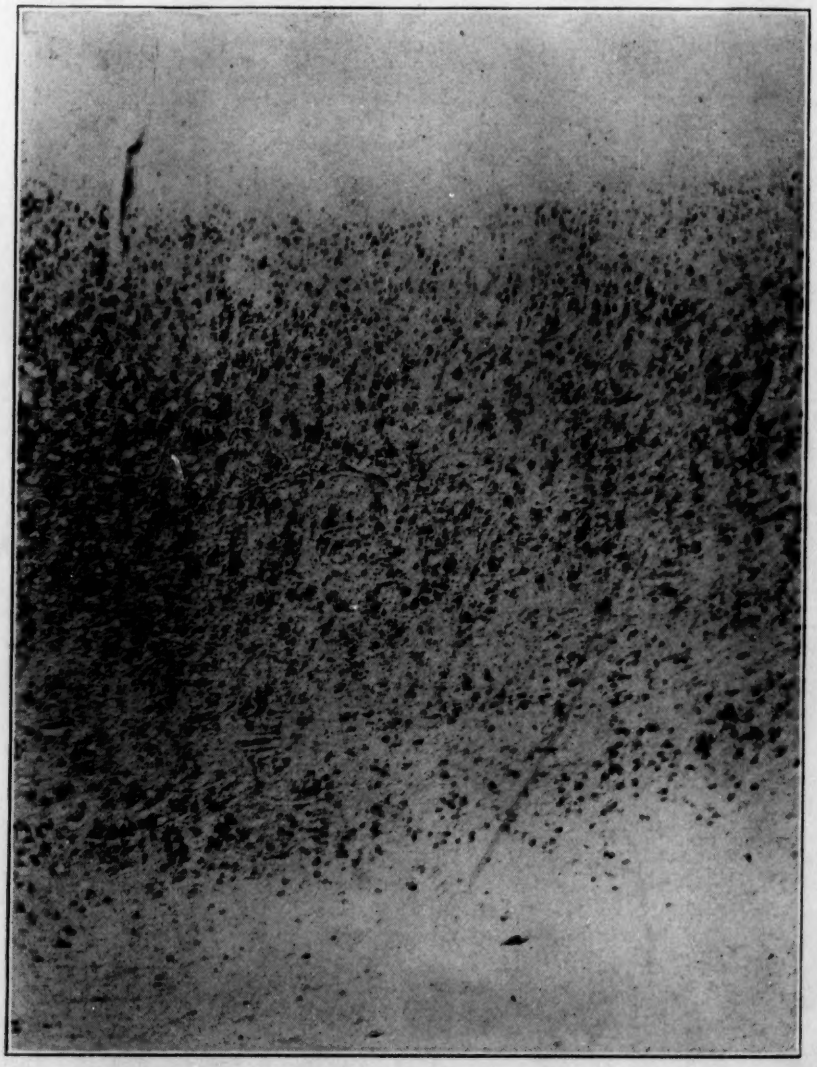

Fig. 3 (case 6).—Nissl preparation of a section from the cerebral cortex (temporal lobe), showing that destruction of the neuron cells was most pronounced in the fifth layer. Low magnification.

Specific stains for lipoids showed that the swollen cells were filled with a larger number of small lipoid granules which stained mat reddish with sudan III and scarlet red, brown with sudan black, blue with blue BZL and black with the Smith-Dietrich stain. Osmic acid and nile blue sulfate failed to stain this material;

the Feulgen and Nadi reactions were likewise negative. Cold acetone and cold ether failed to dissolve these granules, but a mixture of chloroform and methyl alcohol dissolved them readily.

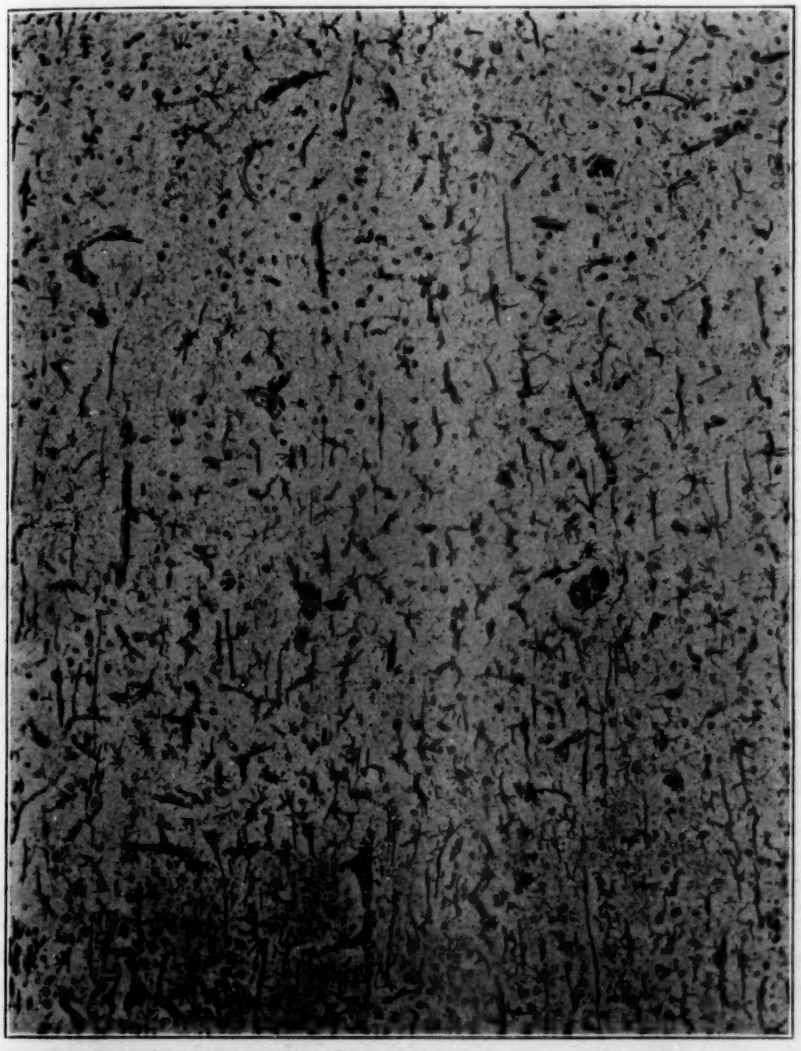

Fig. 4 (case 6).—Hortega preparation of a section from the cerebral cortex, showing the marked increase of microglia cells.

The nerve cells of the basal ganglions, the thalamus and the hypothalamus as well as of the cellular groups of the brain stem also appeared to be diffusely swollen and infiltrated with lipoid material. The alterations in the brain stem, however, were less marked than those in the other regions.

Myelin: The myelin sheaths showed no pathologic change in the Spielmeyer and Weigert preparations. In particular, the optic tract, the optic radiation and

the fibers of Meynert's commissure were not atrophic. However, a few small areas of demyelination were occasionally observed in the subcortical white matter of the frontal lobes. These areas appeared as rather well circumscribed patches, without relation to blood vessels. The destruction of myelin was complete only in the center of the lesion. The axis-cylinders were well preserved, and the macroglia within the lesion showed no more intense reaction than in the adjacent areas of intact myelin.

Glia: The macroglia in the cerebral cortex appeared to have proliferated considerably. A certain increase of glia was also observed in the subcortical white matter. Numerous glia cells showed enlarged cytoplasm and swollen and pale nuclei. Occasionally the cytoplasm of the glia cells contained lipoid granules which showed the same reactions to staining as did the lipoid content of the nerve cells. A striking feature of the pathologic picture was the presence of a large number of microglia cells in numerous areas of the cerebral cortex (fig. 4). This cellular hyperplasia involved all the cortical layers. The majority of the microgliacytes were deeply altered in their morphologic features. Many of them showed the characteristic transformation into rod cells, these being elongated cellular elements with apical dendrites which extended over a long tract. Others showed hypertrophic changes and varicosity of their dendrites. The proliferation of the microglia cells was so great that they reached a number equaled only in cases of dementia paralytica or of trypanosomiasis of the nervous system.

Cerebellum: The cerebellar cortex appeared thinned, the reduction in thickness involving both the granular and the molecular layer. There was also a considerable reduction in the number of Purkinje cells. The neuron cells, including the Purkinje cells, were swollen and contained large amounts of lipoid substance. The dendrites of the Purkinje cells were not swollen, nor were argentophil "torpedos" found along their axons. The basket fibers surrounding the Purkinje cells, as well as the climbing fibers, were reduced in number. An increase of glia cells, especially in the granular layer, was observed in the Holzer preparation. The myelin sheaths in the cerebellum were intact.

Spinal Cord: This structure was not available for examination.

COMMENT

The morphologic changes of the nerve cells in case 6 are characteristic of those in cases of amaurotic idiocy. As is well known, the main pathologic changes in this disease are universal swelling of the nerve cells and cytoplasmic infiltration with granules of lipoids. The lipoid substance exhibits properties of staining and solubility characteristic of a silver protein. These properties were verified in case 6, as previously described. The myelin sheaths, as in case 6, show no important changes. However, occasional small areas of demyelination, similar to those in case 6, have recently been described by Bielschowsky.[11] The macroglia shows widespread proliferation. The striking reaction of the microglia, illustrated in figure 4, appears to be a new feature of the pathologic

11. Bielschowsky, F.: Ueber eine bisher unbekannte Form von infantiler amaurotischer Idiotie, Ztschr. f. Neurol. u. Psychiat. **155**:321, 1936.

picture, although Marinesco [12] mentioned proliferation of microgliacytes in a case of the late infantile type of amaurotic idiocy and Norman [13] pointed out that there were rod cells similar to those illustrated in figure 4 in a case of the juvenile type. The whole pathologic picture, in conclusion, leaves no doubt as to the correctness of the diagnosis, since in no other condition are these extremely characteristic features exhibited. That this case belongs to the juvenile type is indicated by the age at onset and the course of the disease. The striking similarity of the clinical picture in case 6 and in the other 5 cases in the same sibship makes it reasonable to assume that all of them are instances of juvenile amaurotic family idiocy.

Although Spielmeyer [1] expressed the opinion that the recognition of juvenile amaurotic idiocy is a difficult clinical problem, successive studies have shown that both the clinical features and the course of the disease are characteristic enough to make a clinical diagnosis possible. It will be noted that in all the cases here reported the first symptom appeared between the ages of 5 and 6 years and consisted of failure of visual acuity, which slowly progressed until, at about 10 years of age, only perception of light was present. The ophthalmologic examination performed in these cases revealed signs of primary optic atrophy. In addition, in 1 case accumulation of pigment around the disk was reported. Again, in all the cases slowly increasing mental deterioration was noted shortly after the onset of the visual failure. Listlessness, narrowing of interests, emotional apathy and failure to make progress in school were the first signs of the mental defect. In 1 case considerable emotional imbalance was noted for a period of two years; in another case psychotic symptoms were observed which required the commitment of the patient to a state hospital. In all the cases generalized convulsions occurred between the ages of 9 and 11 years; these were rare at the beginning and became more and more frequent and severe with the progress of the disease. The mental deterioration appeared to be markedly influenced by the epileptic seizures. Toward the end, the patients were bedridden and extremely emaciated and led a purely vegetative existence; general spasticity in a flexor attitude was noted. Death occurred in all the cases between the ages of 14 and 16 years.

All these clinical symptoms, as well as the striking uniformity in their chronologic sequence, have also been observed in the large majority of the cases of juvenile amaurotic idiocy reported in the literature. For instance, Sjögren [4] reported the following average figures for his numer-

12. Marinesco, G.: Nouvelles contributions à l'étude de la forme tardive de l'idiote amaurotique, J. f. Psychol. u. Neurol. **41**:1, 1930.

13. Norman, R. M.: A Case of Juvenile Amaurotic Family Idiocy, J. Neurol. & Psychopath. **15**:219, 1935.

ous cases: onset of visual failure at 6 years, shortly after the onset of mental deterioration; beginning of epileptic fits at 11 years, and death at 17 years.

Familial incidence is another characteristic feature of the disease. This is well exemplified by the family described in this paper, in which 6 of 15 sibs were affected. This family is the largest and has the highest number of affected children of any so far on record in the medical literature, the nearest competitor being Sjögren's [4] family no. 4, in which 4 of 11 sibs were affected. Evidence brought forward by Sjögren [4] indicates that the disease is genetically determined and behaves as a recessive monomeric mendelian character. My material, although confined to one family, seems to confirm this hypothesis. To be sure, the observed percentage of affected sibs in the family was 40 per cent instead of the 25 per cent which is theoretically to be expected with a recessive mendelian character; however, in a distribution of families having 15 sibs, 6 persons are theoretically expected to be affected in a certain percentage of the families. Moreover, the parents were normal, as would be expected in the case of a rare recessive mendelian trait, with regard to which the great majority of parents are heterozygous. Uncles, cousins and nephews were likewise normal, as would theoretically be expected, the incidence of juvenile amaurotic idiocy among collaterals of affected persons being below 1 per cent (Sjögren [4]).

Although the main features of both the clinical picture and the underlying pathologic changes in the brain in cases of juvenile amaurotic idiocy appear well established, numerous problems concerning this disease are still unsettled. One of these is the relation between the infantile and the juvenile type. The main clinical differences are in the age of the patients, the duration of the disease and the ophthalmoscopic changes. However, cases of the "late infantile type" have been described in increasing number and, because of the age of the patient (between 2 and 4 years), the duration of the disease and the frequent absence of the "cherry spot," constitute a link between the juvenile and the infantile type. It may be added that the genetic behavior of the two types is identical, the infantile type, like the juvenile, being recessively determined (Slome [14]). Finally, from the pathologic point of view, there is a close similarity between the juvenile and the infantile type of the disease, although slight differences in the staining properties of the lipoid granules in the two types have been brought forward by some investigators. There are indications, therefore, that the two types are closely related in their clinical, genetic and pathologic aspects, although final

14. Slome, D.: The Genetic Basis of Amaurotic Idiocy, J. Genetics **27**:363, 1933.

evidence for their identity can be expected only from chemical investigations, based on fractional extraction and identification of the lipoids involved.

The problem of the nature of the disease is still unsolved. Sjöval and Ericsson [5] have stressed the similarities between the histologic features, such as the presence of intracellular lipoid and the macroglia reaction of the brains of patients with juvenile amaurotic idiocy and senile brains. They expressed the opinion that amaurotic idiocy may be due to a rapid process of senescence. Examination of the histologic preparations made in case 6 shows that this similarity is superficial. The presence of intracellular lipoid is only one feature of the senile neuron, a more important one being the process of cellular atrophy, which is not observed in cases of amaurotic family idiocy. Moreover, chemically the lipoid of the senile brain appears to be a lipochrome, while the lipoid of the brain in a case of amaurotic idiocy is a silver protein (Epstein,[15] Klenk [16]), as indicated by the characteristics of staining and solubility exhibited in case 6. Such pathologic features as senile vascular lesions, senile plaques and Alzheimer neurofibrillary changes, which are typical of senility, are always absent in cases of amaurotic idiocy. Conversely, the intense microglia reaction found in the case described here is not found in senile brains.

Much evidence has been accumulating which indicates that infantile amaurotic family idiocy is a disease characterized by a disturbance of the lipoid metabolism and closely resembles Niemann-Pick disease. The similarities between the infantile and the juvenile type make it reasonable to assume that a similar process is the basis of the juvenile type. Some indirect evidence for this hypothesis is offered by the microglia changes in the case reported in this paper, which consist of marked hyperplasia and hypertrophy of the microgliacytes, with the formation of numerous large rod cells. A similar reaction is commonly observed after an attack of an infectious disease, particularly infection of the brain with treponemes or trypanosomes; it can hardly be explained as being an accompaniment of or secondary to a degenerative condition of the neuron cells, such as is found in cases of amaurotic idiocy. Stevenson,[17] however, recently described a marked increase in the number and the size of microgliacytes in a case of reticuloendotheliosis, a systemic proliferation of the reticuloendothelial cells. Since Niemann-Pick disease and reticulo-

15. Epstein, E.: Beiträge zur Pathologie der allgemeinen Lipoidosen, Ergebn. d. allg. Path. u. path. Anat. **33**:280, 1937.

16. Klenk, E.: Die Fettstoffe des Gehirn bei amaurotischer Idiotie und Niemann-Pickschen Krankheit, Ber. ü. d. ges. Physiol. u. exper. Pharmakol. **96**: 659, 1936.

17. Stevenson, L. D., cited by Foot and Olcott.[18]

endotheliosis are closely related,[18] there is some possibility that in cases of amaurotic family idiocy also the reticuloendothelial system, including the microglia, may be affected. The microglial picture in the case reported in this paper may be interpreted, then, as being similar in character to that in cases of reticuloendotheliosis. Further evidence for this conjecture may be expected from the study of the microglia reaction in cases of amaurotic idiocy, of Niemann-Pick disease, of reticuloendotheliosis and of allied conditions.

SUMMARY

Clinical data in 6 cases of juvenile amaurotic family idiocy occurring in the same family are reported, and the pathologic observations in 1 of these cases are described. Some clinical, pathologic and genetic aspects of the disease are briefly discussed.

Dr. Paul G. Taddiken, superintendent of St. Lawrence State Hospital, Ogdensburg, N. Y., supplied the histologic material in case 6, and Dr. William T. Shanahan, superintendent of Craig Colony for Epileptics, Sonyea, N. Y., furnished the clinical data in case 2. The latter case was included in a clinical study of epilepsy by Dr. Shanahan (Epileptic Masks and the Differential Diagnosis of Epilepsy [case 25], Internat. Clin. **3**:129-164, 1912).

18. Foot, N. C., and Olcott, C. T.: Report of a Case of Non-Lipoid Histiocytosis (Reticuloendotheliosis) with Autopsy, Am. J. Path. **10**:81, 1934.

TOXIC EFFECTS WITH ANURIA FROM A SINGLE INJECTION OF A BISMUTH PREPARATION

REPORT OF TWO CASES

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Reports of toxic effects from a single injection of bismuth, especially when associated with anuria, are rare enough to merit mention. Fatal terminations of such poisonings have been reported by Aubertin and Destouches,[1] by Dowds [2] (3 cases), by Keith and Osterberg [3] and by Eitzen.[4] Beerman, in a review of the literature in 1932,[5] found reports on 22 cases of fatalities due to the use of bismuth in the treatment of syphilis. Most of the reports have been on adult patients under treatment for syphilis or on patients who had had repeated doses of the metal.

Bismuth is somewhat similar to mercury in its action on body tissue. The toxic effects usually noted are stomatitis, gastritis and renal damage. The effect on the kidney may be stimulating, and diuretic oliguria is often produced.

Anuria as a result of a single dose of bismuth, especially in infants, is rare. This complication occurred in 2 infants (first cousins) who were under treatment for acute Vincent's gingivostomatitis. Since Vincent's stomatitis usually responds to therapy in a few days, it is thought advisable to warn of the hazards of using such a drug as bismuth in its treatment.

REPORT OF CASES

CASE 1.—A boy 2 years of age with a history of illness beginning on February 10 was first seen on Feb. 15, 1937. The initial symptoms were a rise in temperature to 103 F. (rectal), vomiting, bleeding from the gums and a slight cough. The past history was normal except for a previous attack of tonsillitis and frequent colds. The family history was irrelevant.

1. Aubertin, C., and Destouches: Un cas mortil d'intoxication bismuthique, Bull. et mém. Soc. méd. d. hôp. de Paris **51**:199-202 (Feb. 17) 1927.

2. Dowds, J. H.: Poisoning by Sodium Bismuth Tartrate Injections, Lancet **2**:1039-1040 (Oct. 31) 1936.

3. Keith, N. M., and Osterberg, A. E.: Acute Bismuth Poisoning with Recovery, Arch. Int. Med. **60**:415-523 (Sept.) 1937.

4. Eitzen, A. C.: Toxic Effects of Bismuth, with Especial Reference to Renal Damage and Report of a Case of Anuria, Am. J. Syph., Gonor. & Ven. Dis. **21**: 674-679 (Nov.) 1937.

5. Beerman, H.: Fatalities Due to Bismuth in Treatment of Syphilis, Arch. Dermat. & Syph. **26**:797-801 (Nov.) 1932.

Physical examination revealed an acutely ill child, in semicoma. He could be roused with difficulty. Examination of the eyes and ears gave normal results. There was acute rhinitis; the mucous membranes of the mouth were reddened, with ulceration and bleeding and swelling of the gums; the throat was inflamed and the tonsils were enlarged, with superficial ulcerations. The remainder of the physical examination revealed nothing abnormal except for a temperature of 101 F. (rectal), a pulse rate of 120, blood pressure of 120 systolic and 76 diastolic and dehydration.

A history was obtained of the intramuscular injection forty-eight hours previously of 0.2 Gm. of a bismuth preparation. The dose given was five or six times that usual for infants of this age. General convulsive attacks had occurred a few hours previous to the examination. No urine had been voided for about twenty-four hours. By catheterization a few cubic centimeters of dark-colored urine was obtained, which showed albumin grade 1, granular and hyaline casts and a few red blood cells. Examination of the blood at this time revealed nonprotein nitrogen 80 mg., urea nitrogen 38.5 mg. and creatinine 4.5 mg. per hundred cubic centimeters of whole blood.

Course and Treatment.—Since the patient was unable to take fluids by mouth, because of the semicoma and vomiting, intravenous and hypodermic administration of fluids was started. Three thousand cubic centimeters of physiologic solution of sodium chloride and 5 per cent dextrose was administered in the first twenty-four hours. Repeated generalized convulsions occurred at frequent intervals, which were controlled by the administration of 2 grains (0.13 Gm.) of sodium amytal. By catheterization twenty-four hours after this treatment was instituted 30 cc. of urine was obtained, examination of which gave about the same results as before. For the next four days convulsions and semicoma persisted, with anuria, in spite of adequate administration of fluids and sweat baths. At that time 200 cc. of whole blood from the mother was given by direct transfusion. On the following day the patient began to void voluntarily small quantities of dark urine; about 75 cc. was produced during this period. A transfusion was repeated three days later. For about ten days semicoma and convulsions continued, with scanty urine. Urinalysis still showed albumin and casts. On March 2 examination of the blood showed nonprotein nitrogen 46.01 mg., urea nitrogen 21.5 mg. and creatinine 2.8 mg. per hundred cubic centimeters.

From this point convalescence was fairly rapid. Stomatitis had disappeared entirely. In September results of a physical examination and urinalysis were normal, a phenolsulfonphthalein test showed normal excretion and examination of the blood showed 14.6 mg. of urea nitrogen per hundred cubic centimeters.

Case 2.—A girl aged 15 months (a first cousin of the patient in case 1) who had been ill for five days with acute Vincent's gingivostomatitis was first seen on Dec. 4, 1938. The initial symptoms of the illness were a rise in temperature to 103.5 F. (rectal), vomiting and ulceration and bleeding of the gums and the mucous membranes of the mouth. The past and the family history were without significance.

Physical examination showed that the patient was in semicoma; occasionally she would rouse herself and cry. Examination of the gums showed much swelling, redness and ulceration. The temperature was 102 F. (rectal) and the blood pressure 110 systolic and 66 diastolic. The pulse rate was 120; dehydration was marked. There were no changes in the reflexes. Thirty-six hours before a single dose of 0.15 Gm. of a bismuth preparation had been given intramuscularly. A generalized convulsion had occurred about two hours previous to this examina-

tion. Complete anuria had been present for about twenty-four hours. By catheterization about 15 cc. of amber-colored urine was obtained. Analysis showed a 3 plus reaction for albumin, a few hyaline casts and a few red blood cells.

Treatment similar to that used in the first case was employed. During the first twenty-four hours 1,500 cc. of 5 per cent dextrose and physiologic solution of sodium chloride was given intravenously, in addition to 750 cc. by hypodermoclyses. Sodium thiosulfate was tried. Sweat baths were instituted. Complete anuria persisted for seventy-two hours. There were repeated convulsvie attacks during this period. An analysis of the blood at the time of my first examination showed nonprotein nitrogen 88 mg., urea nitrogen 46.5 mg. and creatinine 6.5 mg. per hundred cubic centimeters of whole blood. On the fourth day a transfusion of 175 cc. of whole blood from the mother was given. Small amounts of urine, totaling 60 cc., were voided. The convulsions subsided. Fluids were taken by mouth. On December 22 the patient left the hospital. Examination of the blood at that time showed nonprotein nitrogen 35.6 mg., urea nitrogen 13.8 mg. and creatinine 1.7 mg. per hundred cubic centimeters.

Since that time the patient has been observed regularly. An examination on Nov. 10, 1939 showed a normal child, a little over 2 years of age; results of examination of the urine and blood were normal.

The acute onset of anuria in these 2 cases suggested poisoning by a heavy metal. Almost identical histories of the antecedent illness and of the drug used were obtained in the cases of these 2 patients, who were first cousins. It should be stressed that care is essential in administernig bismuth to patients suffering from acute infections which usually respond readily to other treatment, and that this metal should be cautiously used for all children. The urine should always be watched carefully during treatment with bismuth, and any deviation from normal should be a signal for the discontinuance of the drug.

PURULENT POLYARTHRITIS DUE TO STREPTOCOCCUS VIRIDANS

ITS OCCURRENCE IN AN INFANT OF SEVEN WEEKS

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The incidence of purulent polyarthritis due to Streptococcus viridans is highest after the first year of life, reaching its peak between the ages of 11 and 20 years.[1] The disease is a rarity in infants under 6 months of age. Various factors enter into the relative absence of all infectious diseases up to the sixth month of life; predominant is the temporary immunity conferred by the mother.

A case of purulent polyarthritis due to Str. viridans in a 7 week old infant in which a focus of Str. viridans in the mother was considered the source of infection is of interest and is reported.

REPORT OF CASE

D. W., a white girl, had a normal birth at full term on Oct. 19, 1939. Six weeks after delivery at home in the country, the family moved to Kingston, N. Y. Suppurative conjunctivitis present in the child at this time was treated by an ophthalmologist. Almost coincident with the conjunctivitis, a swelling developed over the left maxillomandibular joint. According to the father, this swelling subsided, to be followed by a similar one on the right side. It was stated that the child was breast fed and had some difficulty in nursing.

At the age of 7 weeks a swelling appeared over the left shoulder joint. The parents believed that they might have rolled over on the infant, who slept between them at night, and also that there might have been a birth injury.

The physical development of the child's mother, aged 18, was good, but her mental equipment was poor. The patient, brought for treatment by the father, was the first child born to these parents. Two weeks before delivery the mother had had a severe toothache, which had not completely subsided two months later.

On examination, the infant made no attempt to move the left upper extremity, which was limp. Moving the arm caused the child to cry. There was a large indurated swelling over the left shoulder joint and axilla. A roentgen examination was negative for dislocation. Five days later the swelling over the left shoulder joint became fluctuant, and simultaneous fluctuation and swelling were noted over the right elbow.

The infant was poorly nourished, with poor tissue turgor and moderate pallor of the skin and mucous membranes. Some congestion of the conjunctivas was present. Three maculopapular areas were noted over the glabellar region. The temperature ranged between 99 and 102 F. The blood count showed 3,270,000

1. Veal, J. R.: Acute Suppurative Arthritis, New Orleans M. & S. J. **87**: 8 (Feb.) 1935.

red cells, a hemoglobin content of 58 per cent and 29,200 white cells, of which 68 per cent were polymorphonuclear leukocytes and 32 per cent lymphocytes. The urine showed a trace of albumin, a few red blood cells and innumerable leukocytes. The blood culture was sterile.

For diagnosis fluid was aspirated from the areas of both infected joints. The joints were then incised and drained. Sulfapyridine was given in the amount of 1 grain (0.06 Gm.) every four hours, but no special benefit could be ascribed to the medication.

Culture of the thick, grayish green, purulent fluid from the joints and of material from the infected tooth of the mother yielded Str. viridans. The mother was considered the source of infection. The swelling in the maxillomandibular joints apparently had been a transient involvement; later, purulent polyarthritis from Str. viridans became established in the joints of the left shoulder and the right elbow of the infant. Failure of arthritis or other metastatic involvement to develop in the mother from the focus in the tooth was considered due to her increased resistance to the organism. The infection in the child's joints may have been the result of the mother's inability to confer a sufficient number of immune bodies on the infant or an infection with Str. viridans too great for the child to combat.

The patient improved rapidly after the second week. Full range of motion was established in the left shoulder joint after the fourth week. The purulent condition was longer in clearing from the right elbow. This joint was left with a very limited degree of motion.

The patient entered the Benedictine Hospital a malnourished, 7 pound (3,175 Gm.) infant and was discharged five weeks later a well nourished, 10 pound (4,535 Gm.) baby.

INFECTION OF SCALP AND CILIA WITH PHTHIRIUS PUBIS IN A NINETEEN MONTH OLD BABY

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AND
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In spite of the fact that the pubic louse (Phthirius pubis) may be found on the eyebrows and on the eyelashes of patients with an extensive infection, involvement of the scalp is extremely rare. There are only some 10 cases reported in the foreign literature.[1] Tauber [2] has suggested that cases may have been seen and the condition considered merely as ordinary infection with Pediculus capitis because the parasites were not examined carefully. Lavender [3] has mentioned a case of such an infection in an adult. Sabouraud,[4] a great authority on diseases of the scalp, wrote that "one never finds this [pubic louse] on the scalp." The reason for this difference in localization is not known at present. One theory is that this particular louse has become adapted to growing in areas where the apocrine form of sweat gland is found.[1f] The ciliary involvement is explained by some through the close similarity of the meibomian glands to the apocrine glands. This explanation is confusing, however, because these glands of the eyelids are related much more closely to sebaceous than to sweat glands.

The few cases of involvement of the scalp listed in the literature have been mostly in children. In 1 of 3 cases of this type of infection in children, Klövekorn [1f] described maculae caeruleae on the posterior portion of the scalp of an older girl. Bishopp [5] has suggested recently that the

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1. (*a*) Pick, W.: Tierische Parasiten der Haut, in Jadassohn, J.: Handbuch der Haut- und Geschlechtskrankheiten, Berlin, Julius Springer, 1929, vol. 9, pt. 2, p. 535. (*b*) Heisler, I.: Pediculi pubis auf der behaarten Kopfhaut, Arch. f. Dermat. u. Syph. **24**:589, 1892 . (*c*) Dubreuilh, W., cited by Pick.[1a] (*d*) Brault and Montpellier, cited by Pick.[1a] (*e*) Oppenheim, M., cited by Pick.[1a] (*f*) Klövekorn, H.: Ueber das Vorkommen von Filzläusen auf dem behaarten Kopfe, München. med. Wchnschr. **71**:580, 1924.

2. Tauber, E. B.: Personal communication to the authors.

3. Lavender, H. J.: Personal communication to the authors.

4. Sabouraud, R.: Diagnostic et traitement des affections du cuir chevelu, Paris, Masson & Cie, 1932, p. 529.

absence of hair from other parts of an infant's body may be responsible for this particular parasite's taking up its abode in the scalp and the ciliary areas. As a rule, infection with the pubic louse in children is acquired through contact, especially in sleeping, with infected adults.[6]

REPORT OF A CASE

The patient was the 19 month old daughter of a physician. There was a history of blackish brown spots on the scalp for some three months prior to examination. These were assumed to be spots of dirt and sand and were rubbed out thoroughly, but they recurred in spite of vigorous and repeated washing of the scalp. The child appeared irritable at times but did not scratch her head. Only recently these spots had become more numerous and whitish areas were noted on the lashes of both eyes.

On examination the baby appeared comfortable and cheerful. She was fair skinned, with rather heavy blond curly hair. The skin was entirely normal.

Scattered over the scalp, especially above the ears, over the posterior cervical area and over a small area just inside the hair line in front were numerous grayish and light brown specks, seemingly embedded in the scalp and also firmly attached to hairs. In these areas were bits of black material which brushed off easily from the scalp. To the hairs in these places adhered small whitish oval bodies. The most extensive involvement of the scalp was in the posterior cervical area. In this part there was slight redness but no secondary eczematization or impetiginization. In this connection it should be mentioned that the posterior cervical area is also the commonest site for infection with P. capitis. There was no cervical adenopathy.

The eyebrows were entirely clear. The eyelashes were beaded with little whitish bumps, and there were dark brown spots along the margins of the lids. The brown spots here were darker than those found in the scalp (color adaptation of the parasite?). There was only slight marginal blepharitis.

The spots in the scalp were identified readily as the pubic louse (P. pubis). Because of the unusual distribution of this parasite, a specimen, with several ova, was sent to the Bureau of Entomology and Plant Quarantine of the United States Department of Agriculture. F. C. Bishopp,[5] of this bureau, confirmed the identity of the parasite as P. pubis.

There was slight improvement in the infection after 5 per cent ammoniated mercury ointment (U. S. P.) was rubbed daily over the scalp for three days. However, active parasites were still found after this procedure. Benzyl benzoate cream [7] was then substituted, and daily washing of the scalp followed by rubbing in of this cream cleared up the condition in a few days and caused no irritation. The infection in ciliary areas did not respond to 1 per cent yellow mercuric oxide ointment (U. S. P.), and benzyl benzoate was tried cautiously but was discontinued at once because of an immediate severe reaction. The parasites were removed, and the eyelashes were all trimmed by an ophthalmologist. After

5. Bishopp, F. C.: Personal communication to the authors.

6. Fox, H.: Diseases of the Skin in Infancy and Childhood, New York, D. Appleton and Company, 1930, p. 157. MacKee, G. M., and Cipollaro, A. C.: Skin Diseases in Children, New York, Paul B. Hoeber, Inc., 1936, p. 54.

7. Goldman, L.: Cream Modification of the Benzyl Benzoate Treatment for Scabies, Arch. Dermat. & Syph. **39**:878 (May) 1939.

this procedure the condition improved. An effort was made to find the source of infection of this child. Results of examination of the family were entirely negative. A nursemaid employed during a southern trip was suspected, but the girl could not be found and examined.

Attempts were made to infect the scalps of 2 children, using active female parasites and hairs having ova. The 2 children were Negroes, each aged 3 years. One child had heavy bushy hair and the other hair combed into the distinctive pattern of Negro children. Negro children were chosen because it has been our experience that pediculosis of the scalp, even from the ordinary P. capitis, is rare in children of this race, in spite of their frequent poor hygiene and uncleanliness. After one month the scalps of both of these children were entirely normal.

CONCLUSIONS

A rare case of infection of the scalp and eyelashes with P. pubis (pubic louse) of three months' duration is described in a clean, 19 month old white baby. Simple attempts to infect the scalps of 2 Negro children with the parasite were unsuccessful.

Progress in Pediatrics

INFLECTION POINTS IN THE FIELD OF BEHAVIOR

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I make no apology for attempting to discuss in this paper, and in another one to be published,[1] the difficulties involved in the entry of the pediatrician into the field of the problems of conduct. However, in discussing "inflection points" in the field of behavior, I am perhaps introducing a somewhat unwarranted statistical analogy. An "inflection point" is that place at which a curve suddenly and dramatically changes its course. The present holder of the Rachford professorship of pediatrics has long since taught me (among many other things) what spice words can add to thought; so I was tempted to offer a somewhat new dish in this paper and to season its title in such a way that only the most devious minded would be able to guess its real "stock."

My subject boils down to an attempt to consider certain basic (and I believe serious) questions that must be answered if the pediatrician is to enter the field of mental hygiene and the disorders of conduct. Nothing in this paper is written in the spirit of dissuading the pediatrician from this exciting venture. However, I am sure that this field is not just another subject or department of medicine and that as a psychiatrist I perform no disservice in pointing this out. Dr. Bronson Crothers,[2] one of the earlier Rachford lecturers, treated some of the aspects of this question in detail in his volume "A Pediatrician in Search of Mental Hygiene." He rather gingerly advised the pediatrician to move ahead as rapidly and as far as his traditional role of physician will allow. My own view is that the issues do not allow of this and that, once clearly seen, they demand either that one stay out of the field of behavior or that one reorganize certain of one's basic medical concepts. I wish to make myself clear. Old wine—and old wine in old bottles—is in no disfavor with me. Nor have I the slightest

Lecture 1 of the Ninth Annual Rachford Memorial Lectures, given at the University of Cincinnati College of Medicine, Oct. 17, 1940.

1. Plant, J. S.: Negativism: Its Treatment and Its Implications, Am. J. Dis. Child., this issue, p. 358.

2. Crothers, B.: Pediatrician in Search of Mental Hygiene, Oxford, Commonwealth Fund, 1937.

criticism to make of others who would cling to traditional concepts. I am only certain that, as regards the field of behavior, any one in the business of making new wine must not put his product in old bottles.

I start with three assumptions. The first is that the pediatrician is interested in the behavior (or conduct) of his patients. (*a*) Certainly this behavior is inextricably interwoven with their physical development and their progress. What pediatrician would assay his simplest problem without taking into account the bright courage or the panic-stricken fear with which each pain will be met? As convalescence moves on to recovery, the rapidity of the process is judged largely by whether the child looks forward to returning to playground and school with happiness or with tense anxiety.

(*b*) Moreover, behavior must be a field of increasing study and inquiry for the pediatrician because his patients' families are increasingly asking him about it. This growing preoccupation with what the child's behavior means instead of what it is brings to the pediatrician's door a new and embarrassing set of questions. Some pediatricians have been sufficiently upset by the situation to launch an attack on psychiatrists as being the source of the evil. In reality, psychiatrists share the common woe of living in an age when a confused, bewildered populace is asking many new questions, nor do they (though this is probably the first time in history that a psychiatrist has made this admission) have the answers. Whether he likes it or not, the physician (and I think the pediatrician in particular) is being turned to more and more for authoritative pronouncements on the meaning and the control of behavior.

(*c*) Finally, it is in the child's behavior that the pediatrician will get most quickly the surest clues to those interrelationships of the family which play so important a role in the child's physical progress. Each child comes on the stage as an actor. As he comes from the wings the role he is to play is pressed into his tiny hands. This role is determined by the dreams, the yearnings and the disappointments of his parents, garnered from their living of their own childhood and youth. The ritualistic watchfulness for each small symptom, the never sated parental anxiety over even the simplest habit formations, the jaunty carelessness, the refusal to accept anything good of the child—all these reactions, and many more bespeak the adult's critical eye on the child who is attempting to play his role. The constant bothersome rebellion, the twinkling naughtiness with which all parental plans are thrown to the winds, the panic-stricken anxiety when he senses that he is pleasing no one, the steady-eyed triumph when he plays the role given him but in his own way—each of these bespeaks the amateur's effort at "making good." The real family interrelationships will appear only through watching the members of the family together. They do not appear in response to questioning—partly because most adults do not really

recognize and interpret the emotional drives that impel conduct and partly because some of those which they do understand are matters that they do their best to hide from others. So the pediatrician must patiently watch the drama unfold and out of the play which he actually sees slowly piece together the character and the strength of the forces back of the actions.

The second assumption is that behavior is an effort at solving a problem. It might be called a symptom, in the sense that it is the natural and expected result of the problem which was placed before the child. This is not meant to excuse behavior any more than one would excuse the sharp pain of pleurisy. The pain, the fever or the loss of appetite which may characterize an illness are efforts on the part of an organism to solve a problem. So are stealing, lying, playing hookey or persistent bed wetting. I am not saying that in either case the result is desirable or even pleasant. However, I am sure that in neither case is any real progress possible until one has found out what the organism was trying to do. That will be a fine day when those who have discovered that one cannot exorcise pain and fever will have similarly learned that such measures as wheedling, threats, barter, blind punishment or adult temper tantrums will not spirit away the child's efforts at meeting his wants and needs in the confused world in which he finds himself.

The third assumption goes back to an earlier Rachford lecture. It was Dr. Parsons [2a] who so brilliantly pointed out the practitioner's opportunity for research. This has a strange sound to those physicians who grew up in a generation that scorned the data of the clinician. I need not repeat the plea for the clinician to see that the data concerning the actual living organism which is making an adjustment to life are the only really worth while data. From that earlier lecture one can realize that in the field of behavior only the clinician can operate. Here, more clearly than in any other field, one sees that any part of behavior loses its meaning, even its reality, if it is abstracted from the total matrix within which it occurs.

I am tempted to stop at this point, to devote the rest of this paper to tying together assumptions two and three into a plea for more accurate, simple and honest observation on the part of the clinician. I certainly should not be able to resist this temptation if this paper were written primarily for psychiatrists. No other medical specialists have so grotesquely thrown about the nakedness of their ignorance the gaudy rags of supposition and theory. Children are straightforward beings. It is true that they stumble and wobble and are awkward, but they are not underhanded or subtle about what they need and want. Certainly, half of the parents who come to consult me, by spending the

2a. Parsons, L. G.: Research in Pediatrics, Arch. Pediat. **48**:426 (July) 1931.

time consumed in this process in simply watching their children to find out what they were trying to say to them, could obviate my being in the picture at all. Problem children are children who are trying to solve problems. To their own eyes, their methods seem simple, direct and forthright. The small lad who at the dinner table asks the origin of babies or retails some particularly spicy bit of street lore is trying in the most efficient manner to get his family to see that they have been leaving him out of their discussions. Imagine his bewilderment when he finds that all this leads him to the psychiatrist, with the worried question as to whether he is not oversexed! May I stress once more that few mistakes will be made if the physician will forever try in a simple, humble manner to see through the child's own eyes what he thinks the problem is. This attitude will be of great service to his patients. If, then, in as simple and direct a manner he will record what he has seen, the results will be of great research value in the whole field of medicine and particularly in the practice of psychiatry.

By making only these assumptions entering the field of mental hygiene is made to seem easy. In fact, it has often been said that the ideas I have been commenting on are nothing more than a return to the practice of the old country doctor. But that is not all; in fact, I am sure that there are involved at least the following six important questions or new points of view, which I have called inflection points.

1. Most behavior is behavior in relation to other people. As long as one is considering the functioning of the physical organism, one measures its efficiency and optimum condition in terms of itself. However, when one enters the wider field of behavior, efficiency and optimum condition become factors to be measured by the standards of others. Suppose I am asked to treat a child who is average in efficiency, that is, whose performance is 100 per cent of that of the average in his total environment. If I can produce an improvement of 20 points, I have performed a great service for this child. This result may be achieved in the physical field (through such means as medicines or operations) or in the mental field (by the relief of disturbing emotional tensions, for example). Suppose now that I am consulted about another child who is 60 per cent efficient and that I have, once more, means at my disposal for raising that efficiency 20 points. Should I take this step? The problem is now different, if one is thinking in terms of behavior and social adjustment, because I shall be taking a child from a protected sphere and throwing him into a world of competition, for which he is poorly equipped. Society in such forms as parents, school teachers, playmates or employers makes every allowance for a person of 60 per cent efficiency but none for one of 80 per cent efficiency. One can question seriously what service the improvement in efficiency would render this second child or his family. One can

understand why there are more anxiety neuroses among children with intelligence quotients around 90 than among those whose rating is about 70. The physician gives short shrift to the absurd shoes or other foolish attire and the irrational dieting of a silly, adolescent girl. That condemnatory point of view is simple, easy and sound as long as he is treating a physical organism, for whom there are standards or norms of physical well-being. But when this same girl is considered in terms of her social adjustment, the standard immediately changes.

It is the physician's job to "get people well." In the physical sphere this is a hard task, but at least one knows what "well" is; there is a single goal, and the only task is to attain it. But in the field of social behavior the goal is set by others than the patient. I call this an inflection point because it involves a fundamental change in the concept of health.

Suppose a fine, bouncing, aggressive, mischievous boy of 6 years is brought to the physician. It is well enough to announce that he is a fine specimen and to send him on his way. It is well enough, that is, until one finds that his parents never wanted a boy, have nagged and punched and pulled at him these six years and will continue to do so. Is this the physician's affair? If he says "no," I am the last to criticize. (The family, however, will be the first to criticize and will shop around to every physician and pseudophysician until they find one who does consider this his affair.) If he says "yes," he is at an inflection point in the practice of medicine, because he must adopt an entirely new concept of what is meant by health. Health becomes a function of the standards and the needs of all of the other members of the family, as well as a function of the patient's own physical organism. In such a family as that I have cited one may find all sorts of stubborn habit problems, disorders of speech or persistent rebellion and negativism, or one may find such phenomena as "weak stomachs" and nausea, playing hookey or running away. Yet when each person is studied individually, one finds nothing but a perfectly normal, usual, nice, attractive, lovable being.

2. I have had more difficulty with the second inflection point than with any other single challenging item in this whole field. This point might be called "the dilemma of the expert." An expert is one who has had experience. If I am an expert in chemistry, many will come to me with questions about chemistry, and I shall give them answers. If I am an internist, it is with assurance that I shall prescribe this diet and those medicines. But when the child says to me; "Where is happiness, where is security and where is tolerance?" I can say only, "I wish I knew." Some persons are experts in chemistry, some are experienced in physics and some in law, but all are experienced in living. After all, that's all any one has ever done.

The Joneses bring John, who has a rash, to the physician. He knows how to treat it. He knows, and they know that he knows. What is perhaps more important is that the Joneses want the physician to know more than they do about it. Next month they will come with another problem. This time it may be about school, about play or about discipline. The physician does not know the answers because in each case they go back to the values which each person has. He has his own values, as I have mine, but will they do for any one else? I call this an inflection point because it involves a complete change in the patient-physician relationship. I am not at all sure that it is a wise change. I am not at all sure that the patient can afford to depend on some one who does not know more than he. Life has many beautiful and rich hand-in-hand relationships. Playmates, husband and wife, friends, business associates—in these pairings persons go hand in hand, searching for the meaning of life. Much of the strength of the bond, its worthwhileness, comes precisely from the fact that neither partner really permanently leads. But this has not been true of the physician-patient relationship.

The answer is easy for the physician. There is nowhere any more thrilling venture than that to which the doorway is: "I don't know—let's work it out together." I have never had gallstones or a peptic ulcer or a broken leg. Yet my training would allow me to become an expert in dealing with these or with similar conditions. But in the field of the disorders of conduct, I can truthfully say that no child has ever come to me whose basic problems differed from those which I have and for which I, too, have as yet failed to find the answer. It is true that I have never been a young unmarried mother, but the recognition, the security and the response that such a young woman sought in what she did—those are things I am still looking for, and so is every one else.

This is, perhaps, the knottiest problem. To me the issues are clear, it is the choice that is difficult. The matter concerns what the physician and the patient can afford to have their relationship be. That is not all of it, however, because the traditional relationship, through sheer accumulation of tradition, resists change.

3. The third inflection point, again, involves a serious challenge to the traditional medical point of view. The physician has always been a lone worker, and perhaps he should not give up this role in view of the responsibility which society places on him and which he cannot share. Unquestionably, also, there is just as compelling (if less well defined) a demand from the patient that there be one person in control, one person with whom this peculiar physician-patient relationship is set up. But if the pediatrician enters the general field of conduct, he must cooperate with other persons. And by "cooperation" I do not mean

that in some slick way he must learn to use them. I mean that there are, and always will be, other professional persons who will know part of the picture better than he, others who can carry on the essential part of the treatment better than he and others who must assume equal responsibility with him. If accepting these facts involves a change which the pediatrician feels that he cannot make, I have no criticism to offer, but certainly control in the field of conduct, of behavior and of mental hygiene will slip from his grasp. Of course, there is an alternative, one that has been chosen by a fair fraction of my psychiatric colleagues. This is to escape from reality into the practice of psychoanalysis, which still leaves the physician in sole control of the situation. So many outstandingly able men have taken this step that it may seem out of place to criticize this method too vigorously.

I might give as an example the kind of therapeutic job which the school can do much better than any one else and for which it must assume its share of responsibility.[2b] When one runs into such legal problems as delinquency, in which judges and probation officers are involved, one cannot go on waving the regal hand, ordering all sorts of impossible adjustments and then complaining about the court or the other legal machinery if the whole solution of the problem fails.

The proposition perhaps becomes clearest in regard to the social worker. There are good and poor social workers, just as there are both kinds of pediatricians and psychiatrists. The good social workers who have had adequate training in psychiatric social work know much more about the dynamics of the family and of other human relationships than do even the good physicians. There are no medical schools which give adequate training in this field. Unless the pediatrician is ready to work shoulder to shoulder with the social worker, I should advise his staying out of this field entirely. Not only is she equipped with a fund of specialized knowledge; she can do all sorts of things that are impossible for the physician. In a great many instances it is wise for the child to feel that his confidences are kept by the pediatrician. In such instances the social worker can often be the person who "carries on" with the parent or parents while the child can feel that in his contact with the physician he is not simply talking to some one who in another fifteen minutes will retail the whole conversation to his parents. There are many pieces of therapy that have to be "worked out" and painstakingly tried, with many failures. These things can be much better carried through by the social worker, who by visiting the home obviates the more impressive "visit to the doctor," which so often is not undertaken until some serious result has occurred. Moreover, the physician rarely sees the real family! People dress up emotionally for him, just as they do physically. The social worker does not see the real family

2b. An example is given in Plant.[1]

either, its pettiness, its meanness and its real inner joy, but she comes closer to this than does the physician.

The psychologist is another person who should be the physician's ally, to be met with more than condescension. He has all sorts of data about such things as school stresses and language difficulties, which can be at the bottom of some of the most difficult problems, such as persistent nausea. The physician must have his help with such problems as critical school grades and right handedness versus left handedness.

4. The fourth inflection point perhaps does not deserve that title. It is rather what seems to me to be a new approach to the necessary research tasks in this field. This generation has become accustomed to the genetic approach to physical problems. In the mental field an undying debt is owed to Freud for seeing life as the expression of the reverberations of its early dramas. Without considering the question of the accuracy of the psychoanalytic formulations, one can yet see that Freud has presented a dynamic approach to the problems of development. I am here suggesting the possibility of using this same method of attack in a much more direct and realistic way.

The Aldrich book, "Babies are Human Beings," [3] is magnificent in its simplicity and suggests an approach to the concept of growth that can be taken equally well by the parent and by the pediatrician. The five drives which are outlined in that book are definitely observable and form a sound approach to the problem which I wish to state now. These drives, I think, are also demonstrable in older children, in whom their manifestations are much modified. Older children have certain needs or drives over and above the five that the Aldriches have described. The careful collection of data over the next few years by practicing pediatricians concerning children from a few days to 10 or 12 years of age would help to answer the following question: Are these changes and new drives in older children simply the result of an imposition of environmental pressures on the original ones, or are they actually new in the sense that the growing dominance of the cortex really creates new needs? This piece of research is an inflection point because when it is done there will have been laid the foundation of a genetic theory of behavior that will be realistic and honest because based on things actually seen. This particular research task is not to be carried out by the "A Foundation" in the "X Research Center." There is not a practicing pediatrician in this country who cannot carry on this task, provided he is patient, methodical and willing to record what he sees instead of what he thinks he should have seen. I cannot calculate the results from such a venture. At the very least, there would be a calibration of behavior with the fundamental organic urge to change (grow). If, to stretch one's imagination for a moment, some data were collected that seemed

3. Aldrich, C. A., and Aldrich, M. M.: Babies Are Human Beings, New York, The Macmillan Company, 1938.

to tie in these five or so drives with the six or so residues of Pareto, then at last one would be on the high road to tying together the biologic and the social sciences. But if the pediatrician does turn at this inflection point, he must be sure to follow the sign that points toward the actual practice of pediatrics with real children in normal, usual families and neighborhoods.

5. The fifth inflection point involves an entirely new medical approach to the problem of frustration. The ordinary physician sees frustration as perhaps his strongest friend and his best ally. Whether it is the contracted muscles which prevent the use of a broken limb or the sated stomach that warns the eyes against the consumption of further delectables, frustration is a natural physical phenomenon of the greatest importance. I should guess that perhaps three fourths of the "symptoms" seen today could be viewed as safety measures of frustration. At any rate, the physician is accustomed to thinking of frustration as a mechanism for protecting the careful balance of the organism.

But is this the role of frustration in social situations? Does it there become an enemy instead of a friend? Is social frustration ever keyed to the needs or the development of the person? I am not asking whether it is necessary, because of course it is. One knows, for instance, that there are various frustrating feelings of fatigue that prevent an unwise overexpression of the raw, direct sex drive. The patient comes to the physician with sundry symptoms which to himself are amazing and exasperating, but the physician sees them as the patient's best friends. But society's frustration of the raw sex drive is a cat of an entirely different color, for society is far more interested in protecting society than in protecting the individual. This bending (frustration) of the raw drives is used by society to get its own work done and its own unity assured. One learns such axioms as: "Yes, you may eat if you clean your finger nails, wash behind your ears, say 'thank you,' and do productive work"; "Yes, you may succeed over others if you do so much arithmetic today, get such and such marks in school and produce for long hours"; "Yes, you may satisfy the sexual urge if you go through the proper courtship procedures and support your family." It is on this basis of frustration that any organized society is built. But what is the organism's reaction to this imposed frustration? How much of it is good for the individual? Is any frustration from the outside good, or is all of it something that must be put up with for the sake of being allowed the precarious joy of continuing to live in this peculiar world? In shorthand terms, I have described for the pediatrician in these few paragraphs what is the source of the majority of the behavior problems of the patients who will come to his door. When he has clearly in mind his own relation to this new role of frustration, he will be successful in the field of the disorders of conduct. And, further than

that, he will have a great contribution to make to the whole field of education, in the widest sense of that word.

6. There is a final inflection point that I wish to consider, chiefly because it greatly intrigues me. This has to do with what I term "vulnerability." The problems which children bring to the physician are the problems of all children. When one studies the truant, one finds, for instance, that he is rebelling against the unreality of his experience with arithmetic. But all of the children of his school system have had the same teaching. Or when one studies the delinquent, one finds, for instance, that he is rebelling against an inadequate place to play. Then it dawns on one that all the children in his neighborhood have an inadequate play life. So playgrounds are built for all children. Similarly, the patient with tuberculosis taught the physician that every one needs fresh air; the patient with typhoid, that every one needs pure milk. The "problem child" is the problems of the child.

In the physical field the problem of vulnerability is of the greatest importance but is relatively easy of solution. One is constantly asking: Why did this person succumb to such and such a disease? The answer is: Because he was more vulnerable than the others. In the matter of typhoid this answer is not particularly important, because one can make an area relatively free from typhoid bacteria. At the present time this answer is important in relation to tuberculosis because its causative agent is far from eradicated. The physician is expected to "build up" his patients so that they will not be vulnerable to disease. Note, however, that in the physical field vulnerability is synonymous with weakness.

Are the two synonymous in the field of conduct? When a boy plays hookey because he has an unstable teacher, is he the weakest child in the room, unable to "take" what the others can stand? Or, by chance, is he the strongest, the only one with enough fortitude to do something about an unhealthy situation? When a child comes to the physician because she has stomach upsets on school mornings, is she weaker than her siblings, or is she the only one of the group who effectively resents her parents' overweening pressure for high grades in school?

The physician who has gone into the field of conduct has carried with him his earlier concept of vulnerability. He has looked for the weaknesses of the delinquent child, the child with a problem of conduct and the maladjusted child. I am not saying that this is wrong because I don't know that it is. It is at least possible, however, that a fair share of the children with problems of conduct who come to the physician are the best integrated and the most able children. The physician will come more and more, I am sure, to a concept of vulnerability that is based on sensitivity, but he can probably do little more than guess whether he will find that he needs to strengthen the child or to pat him on the back and express his best wishes for keeping up the good work. This

brings up the disturbing problem of values. Suppose that an adolescent girl of foreign-born parents is stealing from the family so that she may dress as well as her mates in school. What is the correct concept of this girl's vulnerability as compared with that of perhaps three others in the same family who are grumbling about the parental stinginess but doing nothing about it? And what is the next step to take? Is the father right in banking every possible penny for the future, or is the young girl right in her efforts to compete successfully with her peers? For each family the values are different. This part of the field is new and challenging; it calls for a revision of concepts of vulnerability, and in it the physician will come face to face with the problem of values which no man can decide for any other.

These are the six inflection points for consideration by the pediatrician who enters the field of the disorders of conduct. I have not covered the whole field; I have, indeed, tried to stay away from a large group of the most exciting problems that it holds because these are to a great extent simply continuations of what the physician is already dealing with in the physical field.

Once more, I wish to say that there is nothing in this paper that is meant to turn the pediatrician away from the field of the disorders of conduct. The problems of this field are so close to his present interests and activities that he could scarcely escape them even if he wished to. The families of his patients come to him with them, and no one is in a better strategic position to give them help than he is. All this can be said at the same time that one realizes that there has been a great deal of loose talk on the whole subject. I am sure that the venture involves new orientations, some of which are in direct opposition to the present basic attitudes of the medical profession. It is for this last reason that I have used the term "inflection points."

I dislike repeating the well worn statement that these are changing times. I do repeat it, however, because the medical profession has been perhaps the most reserved of all in adjusting to these changes. It is not my part to dictate values. If the pediatrician believes that he should hold on to old and well tried traditions, that is his affair, but I hope that I have shown that such a viewpoint precludes his entering the field of the disorders of conduct and mental hygiene. This seems to me a serious mistake, but that is only because I have chosen another set of values. If, on the other hand, the pediatrician does enter this field, he cannot use merely his old tools, no matter how assiduously he polishes them or how many courses he takes. The enterprise requires certain basic changes in attitudes.

The question is not new; in one or another form it has probably bedeviled mankind for countless generations. If one cannot put new wine into old bottles, it comes down rather concisely to the matter of whether one cares for wine or is a collector of old bottles.

NEGATIVISM: ITS TREATMENT AND ITS IMPLICATIONS

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In attempting to discuss negativism I am in part interested in seeing what can be worked out as to this prevalent and bothersome symptom and in part anxious to see how far I can illustrate the points made in a previous paper [1] by actually applying them to an ordinary clinical problem. It will serve my purpose best if I first comment on a case. Admittedly, this case is a "museum specimen," but choice of such an example is necessary to throw into relief the questions to be faced.

REPORT OF A CASE

Esther was 4½ years old when she was first brought to me by her mother because of her stubborn disobedience. "See what I have to put up with," Mrs. Heller reiterated, as the child stood stock-still in the center of my office. It is hard to tell when this negativism began. By then it was so advanced that Esther usually stopped all activity, assuming a sort of catatonic rigidity, if her mother made any suggestion or comment. Even when she was playing with her dolls, if her mother asked what she was doing or remarked how pleased she was with the play, the child immediately stopped—to sit rigidly for many minutes. She showed this same reaction to the grandparents and to other members of the family, though not as markedly as to the parents. Play life with other children had been normal, but during the last six months there had been stiffening even there, so that her hugging had become a sort of elephantine, awkward action. Esther talked to her mother, but if she was asked something or was reproved she would not say a word for fifteen minutes or so. A social worker had seen her stand rigidly for twenty minutes when her mother had pleasantly told her to take off her overcoat, an act in which she was already engaged.

Esther was the older of 2 girls. Rose was still rather young but seemed a placid, cuddly child who fitted in beautifully with the parental oversolicitousness in regard to every household detail. The mother kept every piece of furniture in its proper place, and one would not find a speck of dust in her house. The children were watched over as to each button and each curl. The mother had taken her task seriously and gave every minute of her waking day to it. Mr. Heller, a professional man, had rather withdrawn from the picture. He admired his wife's meticulous care of each household item; he was certainly deeply fond of his

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Lecture 2 of the Ninth Annual Rachford Memorial Lectures, given at the University of Cincinnati College of Medicine Oct. 18, 1940.

1. Plant, J. S.: Inflection Points in the Field of Behavior, Am. J. Dis. Child., this issue, p. 347.

whole family, and he had rather turned over the matter of Esther's growing problem to the woman who had been so efficient in managing all the other family matters. These were really likable, intelligent and friendly persons whom one would enjoy knowing, though possibly while visiting them one would worry a bit about moving a chair to the wrong position or wrinkling some carefully laid covering.

Over the following two year period I saw Esther six times. Each time, I am sure, I did her far more harm than good. Even after she had become a bouncing, happy, "normal" child in regard to all the rest of her day's routine, she showed distinct reserve and physical withdrawal at the clinic. The first five times I saw her only because the social worker felt that the mother had to be given that much assurance that I was watching the progress of things, and each visit meant a set-back in therapy. The last time I saw her illustrates the kind of mistake that the physician is so tempted to make, when he wishes to witness the "cure," without realizing that by indulging the wish he actually only reawakens former unpleasant associations. Suffice it to say that I made each visit as short as possible and that since that experience I have definitely refused to have revisits with negativistic patients. One must realize that while Esther was not actively antagonistic in the office—there were no temper tantrums or "talking back"—she rigidly stood or sat as she was ordered and by way of talking never gave more than a poorly inflected grunt. Children like Esther remind one very much of catatonic patients.

A month or so before I first saw Esther, her desperate mother had placed her in a preschool group, and the teacher was vigorously and valiantly trying "to break Esther of her habit." Praise had really been "shoveled" on the child, and an intensive effort had been made to "bring her out." But matters were getting rapidly worse. Both at home and at school the child would do what she was ordered to do, but she seemed to have built a sort of thick, resistant wall against any approach, no matter how severe or how pleasant.

Esther could not be placed in a school for three months, after which time she entered kindergarten. I used those three months in trying to explain to the mother the matters which I shall comment on a little later. While she saw the problem intellectually and heroically tried to let Esther do her own eating and dressing and playing, not much progress was made. The easiest course would have been to take Esther out of the family—but what would one gain by this? A cure? Yes, a "cure" of Esther, but I was not seeking only that. The only lasting cure lay in a straightening out of the interrelationships of this family group, and this could come only by helping Mr. and Mrs. Heller to clear up their problems.

At any rate, the situation stayed about as it was until it was possible to send Esther to kindergarten, where the real work was begun. Essentially, I left the whole task to the kindergarten teacher. The social worker often saw her but was careful that Esther knew nothing of this. To sum up as briefly as possible, the kindergarten teacher was given only two directions. The first was that she must try never to speak directly to Esther. The second was in that in any situation she was not to jockey herself into such a position that either she or Esther would have to "give in" or lose. In passing, I may say that in the treatment of negativism these are two fundamental points which will never lead one astray.

The not speaking to Esther could not be rigidly carried through because one has to say "good morning" and there are other exceptions. But with this as a principle it was amazing how much could be done with such expressions as: "Let's

sing" (addressing a group) and "Let's march." Every possible effort was made to have Esther always lost in a group, with never any direct "attack" on her. The teacher religiously refrained from any physical contact except as Esther herself initiated it after some four or five months.

The avoidance of the authority issue was just as important in those early months. The child was invited to participate in all sorts of group adventures but never in such a way that she lost face if she complied or that the teacher or the group lost face if she refused. Invitations were always to "something it might be fun to join in on," so that there was no external pressure either way.

Of course, as all this was going on, Mrs. Heller was supported in developing a similar plan at home. This was more difficult because one could not lose Esther in a group there. Things went slowly at home until the mother began to see definite results from the school program. That gave her more confidence than all my words of wisdom ever could have, and the battle was won. At the end of the year of kindergarten the child was still rather shy, she instinctively withdrew at the approach of any other person, and she did not "melt into" the rest of the group as children normally do. But even then no stranger could have picked Esther out as a problem child. By the time she was halfway through the first grade she was a friendly, popular child. I kept in contact by telephone calls, letters or an occasional visit until she was through the fourth grade, when, in addition to her comfortable social acceptance, Esther was easily showing herself to be of much better than average scholastic ability.

No one knows better than I the shortcomings of this brief account. All sorts of interesting and important matters have been skipped. There is too much to cover in this paper to allow of more than an indication here and there of the hours of care that lie back of Esther's change. One thing I wish to point out, I did not use the teacher simply as a new agent. She did the job. I could only discuss the underlying mechanisms with her and had to leave the actual handling to her. She was as much a colleague as is the surgeon the physician consults when he thinks that he may be dealing with a case of appendicitis.

One does not often see as marked an example of negativism as I have pictured here, but the symptom is, I am sure, a universal one from which no one is ever free, except perhaps in very early childhood. Negativism shows itself in at least three phases, through which one goes, with the final result that varying fractions of each of the three phases are used in achieving an adult adjustment.

The earliest and most basic phase is one of physical withdrawal. Perhaps this is not so wise a phrase as "physical tenseness" or "physical stiffening." It is the opposite of "cuddliness." When, during the course of examining children, I put my hands on the shoulders in order to look at the mouth or the eyes, some children "melt into" my hands, while others, though there is no conscious pulling away, make me feel that they would fall over backwards if my hands were suddenly lifted off. The latter reaction is the physical picture of what I am attempting to describe. It is seen in varying degrees in every one, and its presence can be recognized in oneself, its intensity varying from

day to day and from minute to minute. Of course, in adult years there is definite habituation of the phenomenon, so that the variations or the range of this "tension" tends to lessen.

The next phase is more verbalized and usually appears at anywhere from 4 to 6 years of age. It is characterized by the employment of "no" as an answer to all sorts of suggestions, questions and amiable approaches, along with the growing use of protective lying. Parents come to the physician with the complaint: "He tells lies when he doesn't need to; he seems never to be able to answer anything truthfully." The picture that one gets is that of a person who is inordinately suspicious, who has a sort of protective screen thrown out around himself, as though he could never trust any one.

The next phase is well developed by the age of 12 or 13 years, and though it is possible to see its beginnings long before that (at the age of 8), its growth is so subtle and so slow that there is no time at which one can say that it has suddenly appeared as a cleancut symptom. In this phase the child has a sort of "water off a duck's back" attitude, a blasé protection against outsiders that leaves adults standing helplessly by, with the feeling that "he will never listen to reason." One exhorts, argues, persuades and reasons, and seemingly never pierces a defense which does not have the active components that characterize protective lying but which is just as effective.

These are not three distinct symptoms but rather three different ways in which the child meets a certain problem as he gains new powers and controls new types of armament. Two things must be understood. One is that all physical withdrawal, all protective lying, is not due to this situation, nor is negativism the sole source of a blasé attitude. The other is that all three "symptoms" may show themselves in any adult and in unpredictable fractionation. Or only one of them may appear—or any two.

My own theory as to the source of negativism is in disagreement with that of the majority of writers on the subject. However, I have faith in it because it seems a simple assumption which can account for all of the observed phenomena.

All writers are in agreement in assuming that the young baby makes no differentiation between himself and his environment. If the baby could conceive of "I," I believe that this concept would include his mother, the room he is in, the lights and his food, in short, his whole world. Early babyhood has been termed by psychoanalysts (with a fine disregard for the psychologic elements involved) the period of primary narcissism. It is a period in which the alter and the ego are undifferentiated. Almost immediately an interesting process begins to take place—parts of the environments show themselves to be beyond the control of the baby. The mother goes out, the lights go out, warm

clothing comes and goes and so does food. This involves what psychoanalysts call cathexis, a sort of depositing of the emotional load which all of these external things had carried onto the child himself. To illustrate this concept: If I sit down to a table groaning with food and then the waiter takes most of it away, telling me that this was reserved for others, I shall try to get as much satisfaction from the plateful that is left as I originally should have derived from the banquet. It is precisely at this point that I disagree with the ordinary psychoanalytic theoretic formulation. I think that individualization is a far more active process than psychoanalysts assume. To me, it is much more like the process of clothing oneself in the morning, of gathering from various parts of the room the things for the day. Analogies are treacherous companions, always invitingly beckoning one on to ventures one has no business getting into. Thus, one is to go no further with the two that I have used than to observe that they indicate that the process of personalization is looked on by psychoanalysts as essentially passive, whereas I think of it as active. Both active and passive elements are involved, but, for myself, the active ones are by far the more important and persistent.

The principal argument for this view lies precisely in this mechanism of negativism which incorporates those active, digging, insistent traits that appear when a person is frustrated in something he wants to do. During the first four or five years of life there is carried out this active process of "gathering oneself up to oneself," a process of definition of the external walls of the ego, a process, if you will, of personalization, so that one becomes something like a drop of water standing on a dry table. This last analogy can safely be pushed a little further, for just as this drop of water has a condensation at its surface on account of surface tension, so does the personality have what might be called a "wall" around it. It is the thickening of this wall that constitutes what is called negativism and that is first seen as a psychomotor phenomenon.

I shall from this point on term this wall a "wall of status preservation." This is merely a fair shorthand term to denote a mechanism by which each one maintains the sanctity of his personality's own castle. As I shall indicate shortly, the thickness of this wall is in direct proportion to the threats which are made on it. One of the most disturbing aspects of the whole problem of negativism is that the exasperated parent always brings the negativistic child to the physician with the complaint: "He is in need of discipline; he must be made to learn that he can't just say 'no' to everything; you must tell me how I can make him conform," when, of course, this is the last thing that the child needs at this time. When one sees a negativistic child, one can be sure that one is dealing with "bossy" parents or "bossy" teachers.

Anderson Aldrich has shown that there are marked differences among newborn babies in the extent of the stiffening of their muscles in response to interference with their rhythms. Dr. Aldrich has assured me that this reaction remains with the child and that he has followed it up for many years. One must at least, from this, accept the probability that there are individual differences (inherent) in the ease with which a thick wall of personal protection is built. I have seen an accentuation of this stiffening of the muscles in babies so young that one can preclude handling by adults as a cause, and Dr. Aldrich has stated that he cannot tie it up with any unusual factors in the cataclysmic experience of birth.

I am sure that over and above inherent individual differences within wide ranges certain parents and teachers can develop negativism in children. This is not possible, of course, in all children to the same degree, and often the symptom will appear in one child in its physical form and in another as the "no" and the defensive lying. In other words, while the causes for the development of the symptom are largely external, apparently there are inherited differences in the child's susceptibility to its development.

As the personality more clearly recognizes its integrity, it is of course assailed by adults, chiefly by the parents, who "can't leave the process alone." The resultant thick wall, I am sure, appears in every child at one time or another. I cannot conceive of a family that has never overly threatened each child's individuality. (I might even question whether such would be a wise sort of rearing.) Thus negativism only comes to the pediatrician's notice when this protection has become a habitual pattern, when parents or teachers have kept after the child far too frequently and far too much.

Examples of this phenomenon of status preservation appear throughout life. Under certain conditions the "wall" disappears. This may be noted at a symphony concert, when one seems to disappear as an individual. Often when a few persons are sitting in a room one undergoes the experience that is described as: "we seemed to be in perfect accord though not a word was said." I am sure that this should be stated "because not a word was said." The obverse of the same phenomenon occurs during the experience first noted, namely, that when the music ceases and conversation begins, the walls of the personality immediately reappear.

Rhythmic movments in groups certainly destroy this wall. Any one who has had experience as a soldier will know what I mean: The uniform appearance and action of thousands of drilling men wipes out the individual person. This is a part, but of course not all, of the serious problems of adjustment involved in demilitarization.

One of the most interesting phenomena that one sees is the variation in thickness of this wall with different patterns of living. In the country,

where the next neighbor is a mile away, one would not expect a need for a thick wall of status preservation. Thus, one is not surprised to find that in that pattern every one knows such facts as who holds the mortgage on the Smith home and how much has been paid off. In the apartments of a city, on the other hand, one finds people living within a few feet of each other, with the most complete walls of status built up, so that beyond a few carefully guarded pleasantries there is not a word spoken to weaken the wall of protection.

In traveling one finds that confidences are given on a train or a boat which one never gets at home. Persons whom one has never seen and whom one will never see again are, of course, very free in this matter of status preservation. It is rather unromantic to point this out, but I suspect that at least some of the sentimental matters associated with travelers on moonlit seas have somewhat the same source—this freedom one has with strangers because there is no need for status preservation.

One of the most baffling problems is that of status preservation as related to family life. One sees it rather tragically illustrated in parent-child relationships and in sibling relationships, but practically nothing has been written as to the husband-wife relationship. In these relationships the problem is not that of the individual's adjustment to the preservation of the inviolability of his ego so much as it is the conflict of this adjustment with the idea (inherent in the cultural pattern) that members of families should have no secrets from each other. So children, parents, husbands or wives come to the psychiatrist, often not half so disturbed over the actual problem involved as over the fact that they "have never been able to talk it over with ony one, even in the family." If I have made myself clear, it should be evident that it is precisely against the members of one's family that the walls must be most carefully built, that one has to be guarded in what one says to those with whom the three meals of the day are to be eaten. I am sure that the mechanism is basically one of fear and that, whether one likes it or not, the walls are built the most strongly against those who are nearest.

One more interesting matter is that of the depersonalization of this mechanism as it becomes too much of a load for the person to carry alone. Simple observation will indicate the extent to which this has occurred; such things as the type of one's street address, the make of one's car and the size of one's income are used to forestall those many questions which would otherwise batter at this wall of status. One can note, too, how fully advertising agencies have recognized this. Much of their copy promises that the possession of this or that article will comfortably answer questions of status.

These are random illustrations of the mechanism under discussion in this paper. I am sure that there are many more, perhaps considerably

more enlightening ones. I have only tried to make what picture I could of a protective integument that has its roots in fear but which is a rather mechanical device. Negativism is not so complicated a matter as introversion, for instance. I admit that it is often difficult to know whether one is dealing with a rather marked degree of introversion or a fairly solidly built wall of status preservation. But the two states are really very different. The wall of status preservation can be changed with almost magic suddenness. Its thickness and height are dependent on the actual physical nearness or pressure of others. It may be adamant against a "bossy," executive type of person and, the very next moment, quite melt away in the presence of a stranger. The case presented in this paper illustrates how easily and completely the whole picture can be changed. The problems are different from those involved in dealing with the introverted child.

I wish now to review briefly the six points which I made in a previous paper [1] and to try to implement them in terms of an actual problem which faces the pediatrician.

1. In the field of disorders of conduct many others besides the person who comes as a patient must be considered. Esther's mother brought the child to me for discipline. It is Esther's mother who will pay the bill. It happened in this case that the parents were more interested in Esther than they were in those of their particular values which were making the trouble. But suppose that, as usually happens, this had not been the case. If the parents are rather too vigorously orderly or executive or overly careless, demanding or careful and if the child is brought to the physician because he is normal enough or has initiative enough to fight against accepting these values; who is the patient? This question represents a challenge to the traditional attitude of the medical profession, which up to this point has not had to deal with this matter of values.

2. The second point is that in this field the physician is no more the expert than is his patient. After the physician has explained that insistence on obedience results in certain "problems" in the child and that no insistence on obedience causes certain other "problems," the parents invariably ask, "But which is better?" And one can only answer, "I wish I knew." In other words, there are few problems in the field of conduct which do not bring one back rapidly to the problem of what are the real values of life. Man has asked this question through his whole history, and certainly there is nothing outstanding in the annals of the year 1940 to indicate that he has got far with the matter. Further than that, I should suppose it true that no professional group is less trained in this field than are physicians. As long as the physician points out what returns or problems are involved in such conduct as lying, stealing, truancy and following single standards in sexual behavior

he is performing a great service. When he begins to advise for or against such conduct he has walked himself into a bottomless bog, and there is a fair chance that he has taken some of his patients along with him. These issues, I believe, must be seen clearly before a decision is made for or against going into the field of mental hygiene.

3. I purposely chose, in Esther Heller, a child whose case would illustrate a part of the field where the psychiatrist is himself absolutely helpless. Every time I saw her I only made matters worse. She had to be handled by group treatment. Esther is only a poor example of another type of problem which worries me enough to warrant my mentioning it. This is the matter of the added confusion that is involved when another adult is introduced into these affairs. So much meddling with children is done! There is so much pawing over people! It must not be forgotten that most of the children who come to the physician because of disorders of conduct have been discussed and considered already by every adult within hailing distance. This paper is intended to express my hope that the pediatrician will go over into this field, but he must keep his face toward the faraway goal of seeing that the parent and the teacher are so educated and so helped that he will not have to be called in to handle problems that already have the child terribly confused.

4. I should now like to comment on Dr. Aldrich's work and the research it entails. It seems to me obvious that it is of the greatest importance to know whether Esther's problem can be comfortably and realistically carried back to her earliest needs to express her own rhythms or whether new factors came in with the development of cortical control. As life unfolds, how much of what is new is really new and how much is just a restatement of an old problem?

5. One meets in Esther's case the question of the value of frustration as exemplified in the problem of discipline. One must agree that if people are to live together in a society there must be frustration of the individual's raw drives. One must see that this frustration is in the name of society rather than in the name of Esther. One sees beautifully in her case that this frustration completely lacks that check on itself that is provided in the physical field. Physical fatigue, for instance, disappears as soon as it is wise or safe for the body that it do so. But one is completely without a guide as to the value to the individual of social frustration and as to what quantities of it should be given. I have no intention of outlining a complete course in mental hygiene in this paper. I do not care to go any further than to point out that in this field the physician is faced with an entirely new conception of the use and disuse of frustration.

6. One must consider the question of vulnerability. What, after all, is wrong with Esther? Why doesn't Rose show these same

symptoms? Could one, perchance, have handled this whole matter with some tricky manipulation of vitamins? Or, in more exciting fashion, one may ask whether it is Esther or whether it is Rose who is the vulnerable one. Should one worry about the one's bullheaded rigidity or the other's insipid pliability? Or should one once more fall back on the easygoing adage that life should have a bit of this and a bit of that? No problem in this field will offer more interest and more challenge than this. Countless weary books have tried to unravel what is wrong with the delinquent. No one seems ever to have asked what is right about the delinquent. I hope I have written enough to make it evident how radically this concept of vulnerability or weakness differs from any that are used in the physical field.

Up to this point I have tried to restrict my comments to Esther and her family. But now I should like to wander a little afield because toward all patients one has the obligation of seeing that their unhappiness and suffering are made of use to others. So long as one can see that the problem child is the problems of the child one can, I think, justify the price in suffering and bafflement that these children pay.

This wall of status preservation is, certainly, basically a wall of fear. One sees it througout life as something that is instinctively raised with the approach of others. It shows that the first reaction which any one has to the approach of others is withdrawal, self protection or fear. One will find some support for this view in a child's actions during delirium, when the cortical mechanisms of status preservation have been destroyed. So often children in such circumstances show intense fear of the approach of any other person, even of mother, father or nurse.

If such a reaction is universal, I think that it has an interesting bearing on the developments of the last century, because people have congregated in that period as never before. True, there were cities before, but they have recently grown by leaps and bounds. Then in the last fifty years various types of communication have increased the threats to the individual. Thus the telephone, for instance, increases the range and effectiveness of one's control, but by that same token it intensifies the impingments on one's life. All education and a great deal of propaganda teach that greater acquaintance with others increases one's friendship for them, but Esther's case teaches that it is precisely these things that are the source of intense nationalism and of fear. Universal education, the telephone, the telegraph, the motion picture, the airplane, the more rapid transportation by railroad and by bus, the automobile—all these things (and more) have suddenly brought the whole world around one's head in quite as effective a manner as Mrs. Heller's insistent interests had brought a cloud of threats about Esther. One does not question the wisdom of all these phenomena because they exist and one must try to understand their effect rather

than try to change them. One is not in the least disturbed about the future because man adjusts himself to change. The important thing is the rapidity of these changes, and what one predicts is a prolonged period of increased fear, of intensified nationalism, of sharpened intolerance. These are but the logical consequences of what is called progress, a part of the cost of change. Change, or growth, is disturbing. Perhaps a majority of the clinical problems which the pediatrician encounters have as their mainspring the growth of the child, or his attempt at growth. These things disturb him, and they disturb the physician. But once the physician understands what is happening, instead of being irritated by what is happening he adopts an attitude that at least allows him to give the sort of symptomatic treatment that eases the burden.

The pediatrician so naturally sees the child and his family, he so naturally sees problems as they are first crystallizing into serious complications that I earnestly hope that he will enter wholeheartedly into the field of the disorders of conduct. As I indicated previously, I am sure that his patients as well have this hope. I have tried in this paper to make it possible to see further than through Esther's eyes, out into the farthest reaches of man's problems. The gauntlet is down, and many persons have advised the pediatrician to pick it up. I feel that I have done my part if I have in any way clarified the issues, if I have shown that this struggle is with tools and against opponents that are basically strange to the medical descipline.

Once more the old question is reiterated: Is prudence the better part of valor, or is there something of zest, of vision, of blood-stirring courage in the battle itself that makes the question of final victory or defeat rather secondary? This is a question of values, of what one is looking for. Not authority, or money, or book learning, or husband or wife or parent, or fame or "success" should be allowed to whisper the choice in one's ear. Nor do I advise making some willy-nilly middle choice which enables one to play the coward. And once the choice is made, one must stick to it, because that is really the measure of one's faith in oneself.

Abstracts from Current Literature

Metabolism; Infant Feeding; Milk and Other Foods

STUDY OF CERTAIN TISSUE LIPIDS IN GENERALIZED LIPODYSTROPHY ("LIPOHISTIODIARESIS"). ARILD E. HANSEN and IRVINE MCQUARRIE, Proc. Soc. Exper. Biol. & Med. **44**:611 (June) 1940.

Quantitative data regarding the various tissue lipids were obtained in the case of a 9 year old boy who suffered from a rare form of generalized progressive lipodystrophy of at least six years' standing. These are compared with similar data obtained at the same time in a case of fatal subacute nephritis. No neutral fat could be demonstrated by gross or microscopic examination of tissue taken from the fat depots (subcutaneous tissue, omentum, pericardial and perirenal regions) in the case of the lipodystrophic subject. Chemical analyses showed the neutral fat and fatty acids in the liver, skin and perirenal region to be extremely low. The levels of cholesterol and cholesterol esters were higher in the liver of the lipodystrophic patient than in that of the nephritic subject. The phospholipid fatty acids were significantly lower in the former than in the latter subject. This difference was not observed in the other tissues examined.

HANSEN, Minneapolis.

MARASMUS TREATED BY BREAST MILK. E. HINDEN, Proc. Roy. Soc. Med. **33**:371 (May) 1940.

An infant aged 10 weeks was admitted to the hospital with gastroenteritis. He weighed on admission 10¾ pounds (4,876 Gm.) and at first made fair progress; then he had a relapse, and his weight steadily declined. His failure to gain was due to inability to digest food. There was no diarrhea, but the stools contained all the solid constituents of the meal, no matter how it had been modified. A small blood transfusion was given, without apparent benefit. It was suggested that breast milk might be digested. Hospitals failed to procure breast milk, and as a last resort an appeal was broadcast. Within ten minutes twelve mothers were at the hospital and that evening sixty others had telephoned offering their assistance. The milk so provided—84 ounces (2,520 cc.)—was pooled and was enough for three and one-half days, during which the child gained 8 ounces (240 cc.). He was then fed on peptonized dilute cow's milk, gaining 17 ounces (510 cc.) in the next week, and his condition did not regress.

WILLIAMSON, New Orleans.

AMOUNT OF BROMINE IN THE CHILD'S BODY UNDER PHYSIOLOGIC CONDITIONS. A. LEONE and E. CADEDDU, Riv. di clin. pediat. **38**:257 (May) 1940.

The bromine was found to average 646 gamma per hundred cubic centimeters of blood from the umbilical cord (8 cases); 597 gamma in the blood of boys and 644 gamma in the blood of girls. Bromine was present in the blood of all 53 children tested, the maximum value being 951 gamma and the minimum value 439 gamma per hundred cubic centimeters. The bromine in the spinal fluid was between 30 per cent and 60 per cent of that in the blood of the same child.

The level of bromine in the blood was higher shortly after feeding than when the patient was fasting. The basal metabolic rate bore no significant relation to the blood bromine under fasting conditions. The bromine content of mother's milk varied between 400 and 1,502 gamma per hundred cubic centimeters.

HIGGINS, Boston.

Vitamins; Avitaminoses

THE EFFECT OF REDUCED EVAPORATION ON THE VITAMIN CONTENT OF FRESH VEGETABLES IN REFRIGERATED STORAGE. ROBERT S. HARRIS, HARRY B. WISSMANN and DAVID GREENLIE, J. Lab. & Clin. Med. **25**:838 (May) 1940.

Vitamins A, B and C were found to be better preserved when vegetables containing them were stored in an environment of high humidity and low air movement at a temperature of 41 F.

READING, Galveston, Tex.

CEREALS AND RICKETS. XI. CALCIUM PHYTATE AS A SOURCE OF CALCIUM. CARL H. KRIEGER, RUDOLF BUNKFELDT and HARRY STEENBOCK, J. Nutrition **20**:15 (July) 1940.

These Wisconsin investigators found the calcium of calcium phytate as readily available to the rat as the calcium of calcium carbonate. The utilization of both forms of calcium was improved to the same extent with the addition of vitamin D.

FREDEEN, Kansas City, Mo.

NICOTINIC ACID AND THE VITAMIN B COMPLEX IN INSULIN TOLERANCE. J. C. BURKE and A. R. MCINTYRE, J. Pharmacol. & Exper. Therap. **67**:142 (Dec.) 1939.

Working with rats, the authors concluded as follows:

The addition of crystalline vitamin B_6 to a basal diet supplemented with thiamine does not prevent the augmented effects of insulin observed in such animals. Nicotinic acid and (to a slightly less extent) a new lipid material obtained from rice polishings markedly decrease the duration of hypoglycemia following the injection of a standard dose of insulin.

PILCHER, Cleveland.

THE EFFECT OF VITAMIN B_1 ON MORPHINE ABSTINENCE SYMPTOMS. O. GARTH FITZHUGH, J. Pharmacol. & Exper. Therap. **67**:423 (Dec.) 1939.

In view of the relation between the effects of chronic alcoholism (polyneuritis) and vitamin B_1, the author conceived the idea that there might be a similar relation between the vitamin and morphine addiction. Rats habituated to morphine show a preinjection irritability, relieved by the morphine injection. In such rats thiamine (vitamin B_1) relieved the irritability before withdrawal of morphine, but this decrease continued downward after the withdrawal. The result was not due to a toxic action of the thiamine.

PILCHER, Cleveland.

FAILURE OF MATERNAL VITAMIN A DEPLETION TO PRODUCE CONGENITAL ANOMALIES IN THE YOUNG OF RATS. M. D. CANNON, Proc. Soc. Exper. Biol. & Med. **44**:129 (May) 1940.

Previous observations by Hale showed possible dietary causes of congenital anomalies in that microphthalmia, harelip, cleft palate and failure of the kidneys to leave their embryonic position occurred in the young of sows deficient in vitamin A. The author, in a study of rats with vitamin A deficiency, failed to find any evidence of congenital anomalies in the young of these rats. Mating, conception, resorption of fetuses, dead fetuses and protracted labor were seen in these animals.

HANSEN, Minneapolis.

THE USE OF VITAMIN D PREPARATIONS IN THE PREVENTION AND TREATMENT OF RICKETS. CECILLE ASHER, Practitioner **145**:61 (July) 1940.

This paper is a discussion of the various preparations of cod liver oil on the English market with regard to vitamin A and vitamin D content and a plea for the prescription of such products in units rather than in drops or in teaspoonfuls.

GELSTON, San Francisco.

IRREVERSIBLE DECALCIFICATION OF THE NECK OF THE FEMUR IN CHRONIC VITAMIN C DEFICIENCY. G. MOURIQUAND, M. DAUERGNE and V. EDEL, Presse méd. **48**:268 (March 12) 1940.

In previous studies the authors have shown that in experimental animals subjected to prolonged lack of vitamin C osseous changes occur similar to those of chronic ankylosing arthritis. Decalcification affects mostly the epiphyses and the metaphysial region and is most marked in the posterior extremities. Periosteal reaction is also seen, with laying down of calcium, which simulates syphilitic periostitis.

By further studies the authors show this process to be irreversible. Vitamin C given over a period of one hundred and eleven days produced no recalcification. Vitamin D was also added to the diet, with no results. DAFFINEE, Boston.

EXPERIMENTAL STUDIES ON THE VITAMIN A CONTENT OF OLIVE OIL FROM THE PROVINCE OF PALERMO. F. PECORELLA, Lattante **11**:166 (May) 1940.

Olive oil neither cured nor prevented symptoms of vitamin A deficiency in rats fed a diet not containing that vitamin. HIGGINS, Boston.

HYPOVITAMINOSIS IN EARLY INFANCY. JAVIER MENDILAHARZU, MARIA A. GENTILE and EDUARDO CROUZEL, An. Soc. puericult. Buenos Aires **5**:262 (Oct.-Dec.) 1939.

The authors present and discuss 2 cases of lack of vitamins A, B and D.

HERRON, Oak Ridge, La.

EFFECT OF VITAMIN D, ULTRAVIOLET RAYS AND HEAT ON THE T-FACTOR (SUBSTANCES WHICH CAUSE THROMBOCYTOSIS). E. SCHIFF and C. HIRSCHBERGER, Jahrb. f. Kinderh. **149**:81 (May) 1937.

In a continuation of their studies on animals and human beings the authors find that the administration of sesame oil with vitamin D in the form of irradiated ergosterol added has an adverse effect on the production of platelets.

The T factor in sesame oil was found to be inactivated by ultraviolet irradiation. Irradiation of an organism, such as the rat or a human being, when sesame oil was being administered resulted in no such inactivating effect on the T factor.

Heating the sesame oil to 80 C. resulted in destruction of the T factor.

Oxygenation of the sesame oil resulted in no disturbance of the T factor, as demonstrated by experiments on rats. LANDAU, Hannibal, Mo.

Hygiene; Growth and Nutrition; Public Health

PREVENTIVE PEDIATRICS. WILBURT C. DAVISON, J. A. M. A. **114**:742 (March 2) 1940.

Davison reviews the conditions which cause the preventable deaths comprising 56 per cent of the 240,000 annual deaths among children. Another fourth of these deaths are curable.

One fourth of these deaths can be prevented by better antepartum, intrapartum and neonatal care, much of which is available but is unused because the public has not been taught the necessity for it.

Thirty per cent of the total pediatric deaths are caused by conditions preventable by present measures to be used after birth. These may be intercepted during periodic examinations, at which times feeding is regulated, dietary and vitamin needs checked, immunizations carried out and parents instructed in prevention and treatment of illness, accidents and mental problems.

HEERSMA, Kalamazoo, Mich.

RESPONSE TO A QUESTIONNAIRE ON THE PROBLEM OF INFANT MORTALITY IN THE FIRST TWO YEARS OF LIFE. M. GIOSEFFI, Lattante **11**:28 (Jan.) 1940.

The following sentences are culled from an analysis of the causes of high infant mortality.

Immature infants, breast fed and followed regularly in clinics, do not die but reach normal weight for age by the time they are 6 months old.

Syphilitic mothers treated throughout pregnancy will give birth to healthy infants with negative Wassermann reactions.

Administration of vitamin D by mouth and exposure of the child to the open sky will prevent craniotabes and deformities of the thorax and limbs.

The highest mortality from diarrhea and nutritional disorders is among infants not followed in the medical clinics.

Fresh air is very important in relieving and preventing the bronchopneumonia of infants.

Prophylaxis by diphtheria toxoid and pertussis vaccine will reduce infant mortality.

HIGGINS, Boston.

BIOMETRIC MEASUREMENTS ON INFANTS FROM THE VICINITY OF TODI. G. OTTAVIANI, Lattante **11**:94 (March) 1940.

The city of Todi is in the province of Perugia. Legitimate infants were in general larger than illegitimate infants and the infants of pluriparas than those of primiparas.

HIGGINS, Boston.

ORGANIZATION AND FUNCTION OF THE PROVINCIAL INSTITUTES FOR AIDING CHILDREN. F. FERRARO, Med. inf., Rome **11**:33 (Feb.) 1940.

This article reviews the ideal setup for governmental institutions for the care of infants and children.

HIGGINS, Boston.

CONDITION OF POOR CHILDREN IN THE PUBLIC SCHOOLS. LUIS MORZONE, Bol. Inst. internac. am. de protec. a la infancia **13**:513 (Jan.) 1940.

It was found that children from poor homes were definitely inferior physically, physiologically, psychologically and morally to children from families in a better financial condition. For the most part these children cannot be expected to do the same work that the more fortunate ones can, and it is thought better to provide special schools for them, where they can receive adequate nourishment and hygienic and social supervision.

LESLIE, Evanston, Ill.

NATIONAL SALUBRITY SERVICE AND THE CHILD'S PROBLEM (CHILE). GUILLERMO MORALES BELTRAMI, Bol. Inst. internac. am. de protec. a la infancia **13**:746 (April) 1940.

"The author, Chief of the 'Mother and Child Welfare Department,' divides his work into two parts; in the first he studies the legal dispositions in relation to the mother and child protection, the organization of the National Salubrity Service and the results attained in six months; in the second part, he makes a thorough study of the orientation that should be given to that Service, in order that it should fulfil widely the purpose for which it is appointed."

FROM EDITOR'S SUMMARY.

MATERNITY SCHOOLS. POPULAR KINDERGARTENS. LUISA GUIJÓN DE PÉREZ, Bol. Inst. internac. am. de protec. a la infancia **13**:859 (April) 1940.

For the protection and development of the destitute child and the needy preschool child, it is recommended that within the country (Chile) there be created a central organization to unite action in behalf of the child and to coordinate the

work of the different social organizations; the creation of a central office for social service is also recommended. Outside the country the creation of a pan-American commission for the protection of children and the widespread establishment of maternity schools or popular kindergartens are urged. LESLIE, Evanston.

OPPORTUNITY TO EXTEND THE INVESTIGATION OF THE PATERNITY OF CHILDREN BORN OF ADULTEROUS AND INCESTUOUS UNIONS. SAMUEL GAJARDO, Bol. Inst. internac. am. de protec. a la infancia **13**:870 (April) 1940.

The legal qualification of children of adulterous and incestuous unions should be abolished. The investigation of illegitimate paternity should benefit also that class of children. FROM EDITOR'S SUMMARY.

THE REFORMATORY AS A CORRECTIVE AGENCY. SAMUEL GAJARDO, Bol. Inst. internac. am. de protec. a la infancia **13**:874 (April) 1940.

The old reformatory resembling a jail ought to be eliminated as a device for the correction of minors.

The modern reformatory ought to be a reeducational establishment for the correction of the personality of the delinquent child by means of psychologic procedures directed toward social readjustment. FROM EDITOR'S SUMMARY.

OPINION ON THE CRIME OF DESERTION. SAMUEL GAJARDO, Bol. Inst. internac. am. de protec. a la infancia **13**:879 (April) 1940.

The guilty desertion of children is an antisocial act of serious consequences and therefore should be made punishable by law. FROM EDITOR'S SUMMARY.

THE FOSTER CHILD—A SOLVED OR UNSOLVED SOCIAL PROBLEM OF CHILD WELFARE? C. GYLLENSWÄRD, Acta pædiat. **25**:82, 1939.

At this time there are in Sweden approximately 55,000 children who are wards of the state; 50,000 are cared for in private families. An extensive sociologic investigation revealed that the physical and emotional development of these children is far inferior to that of children reared in their own homes. Eighty per cent of the foster children are illegitimate. The notoriously high incidence of behavior difficulties in illegitimate children is probably due to their growing up in boarding homes rather than to the irregularity of their social status. Public care must be improved. One needed reform is the avoidance of frequent change from one family to another. Both the child and the prospective family should be scrutinized carefully and only such commitments approved as appear to be durable. Official statistics should be published more promptly. Changing conditions of modern life endow the matter with vital national importance. MCCUNE, New York.

Prematurity and Congenital Deformities

PREMATURE INFANTS. WILLIAM H. CRAWFORD, GENE B. HABER and ROBERT J. KESSLER, Pennsylvania M. J. **43**:1438 (July) 1940.

After a study of 383 premature babies, the authors believe that an intelligent and enthusiastic nursing and medical staff that is "premature-minded" is the most valuable asset with which to attack the problem of the premature child. Special incubators with controlled temperature and humidity rooms are desirable, but the ordinary hot bed, the isolation technic and a tank of oxygen and carbon dioxide will produce gratifying results. Any one of a variety of foods may be used, and the premature child who has survived the original atelectasis and possible birth injury must be closely guarded against infections of the respiratory tract.

LOGUE, Williamsport, Pa.

MICROMELIA IN ADULT FOWL CAUSED BY MANGANESE DEFICIENCY DURING EMBRYONIC DEVELOPMENT. C. D. CASKEY and L. C. NORRIS, Proc. Soc. Exper. Biol. & Med. **44**:332 (June) 1940.

Most of a group of 15 chicks were micromelic when hatched from eggs of hens fed a diet low in manganese (0.00063 per cent manganese). They were then placed on a diet containing an excess of manganese (0.02 per cent). Eleven of these chicks (8 females and 3 males) attained maturity and were maintained on this diet until they were 16 months of age. No recovery from the micromelia occurred.

HANSEN, Minneapolis.

DOUBLE MONSTERS IN THE LIGHT OF RECENT BIOLOGICAL EXPERIMENTS AND INVESTIGATIONS REGARDING HEREDITY: CONTRIBUTION TO THE PROBLEM OF THE DETERMINATION OF SEX. BALAZS SZENDI, J. Obst. & Gynaec. Brit. Emp. **46**:836 (Oct.) 1939.

Two thoracopagus monsters are described, and the embryogenesis is discussed. The 2 monsters were united in their longitudinal axes, were mirror images of each other and had a common placenta, cord, liver and heart. In the first specimen 1 of the united twins was a pseudohermaphrodite and had atresia and dilatation of the rectum; in the second specimen 1 twin exhibited right hemiplasia of the internal genitalia.

Three possible explanations of the formation of such a monster are: (1) that it results from some peculiarity of the male or the female gamete; (2) that it results from abnormal fertilization, and (3) that it results from abnormal differentiation of a normally fertilized single ovum or of two normally fertilized ova.

ADAIR and POTTER, Chicago.

ON THE VALUE OF CEPHALOMETRY IN THE ESTIMATION OF FOETAL WEIGHT. J. G. HASTINGS INGE, J. Obst. & Gynaec. Brit. Emp. **46**:1003 (Dec.) 1939.

Biparietal and occipitofrontal diameters of 1,010 infants were measured and correlated with birth weight. The conclusion is reached that the variation in diameter of the head is too great to allow an accurate estimation of birth weight or maturity in any given case, although in large groups the average diameters afford a rough guide as to average weight and maturity. The minimal weight was 2¼ pounds (1,120 Gm.) below the estimated weight.

ADAIR and POTTER, Chicago.

IMPORTANCE OF OSSEOUS SIGNS IN PREMATURE INFANTS. F. PONTIERI, Med. ital. **20**:550 (Nov.) 1939.

Pontieri feels that examination of the bones is of great help in determining the maturity or immaturity of a newborn. A constant sign of immaturity, according to the author, is abnormal shortness of the medullary canal of the long bones. This canal in the newborn infant at term constitutes 30 to 40 per cent of the diaphysis. In some premature infants born in the seventh month the length of the medullary canal was 20 to 25 per cent of the length of the diaphysis. The sphenoid bone in the 7 month fetus has five pieces, whereas in the infant at term it has three pieces. In 50 per cent of the author's cases there was a supernumerary fontanel.

MARTOCCIO, Utica, N. Y.

DEFORMITIES OF THE CRANIUM AND SPINAL COLUMN IN INFANTS. LEONARDO DOMINICI, Pediatria **47**:741 (Sept.) 1939.

The author briefly discusses the origin of deformities of the cranium and the spinal column. The most frequent anomaly of the spinal column is spina bifida. The author lists three forms, the posterior, the anterior and the occult. The etiology and the treatment are discussed. The malformations of the cranium are listed, such as acrania, cyclopia, microcephaly, acrocephaly and cephalocele.

MARTOCCIO, Utica, N. Y.

PREMATURE INFANTS. DELIO AGUILAR GIRALDES, An. Soc. puericult. Buenos Aires **5**:153 (July-Sept.) 1939.

This paper is a good presentation on the premature infant, giving only the incidence, morbidity and mortality rates as found in Buenos Aires, Argentina. No treatment is considered.

HERRON, Oak Ridge, La.

TEST RESULTS WITH PREMATURE CHILDREN. L. BEITEL, Ztschr. f. Kinderh. **61**:533 (Feb. 17) 1940.

Hess, Mohr and Bartelme found no evidence of mental retardation among prematurely born children when those who had suffered birth injury were excluded. Brander, on the other hand, reported only 46 per cent with normal intelligence (intelligence quotient 91 to 110). He concluded that birth injury and birth weight are of great importance. He thinks that normal intelligence is found only in infants weighing more than 1,510 Gm. at birth.

The author studied 119 infants and children, utilizing the Viennese test method, which includes six different aspects of development. Of the 119 children, 58.5 per cent showed normal development; 12.5 per cent were above normal, and 29 per cent were below normal. After exclusion of 3 children with birth injury or an inherited mental taint, the average intelligence quotient was 98. It rose with advancing age. He thinks that many children with intelligence quotients below normal improve as they grow older. Only a slight relation of intelligence quotient to birth weight was observed.

Beitel agrees with Gesell's concept regarding the maturation of the premature child regardless of time of birth and regardless of external factors.

SIEMSEN, Chicago.

CONGENITAL DISLOCATION OF THE RADIUS. C. M. MENG, Chinese M. J. **57**:479 (May) 1940.

Little has been written about this rare condition, but it may be confused with acquired traumatic dislocation. The case reported is that of a school girl who had motion in both elbows limited to the semiflexed position. The heads of the radii were displaced far forward, with the forearms fixed midway between supination and pronation. The roentgen films of the wrists showed that the styloid processes of both the radii and the ulnas were absent. Resection of the heads of the radii was suggested, but the patient refused.

NEFF, Kansas City, Mo.

ON THE FETAL PELVIS. H. YAMAMURA, Jap. J. Obst. & Gynec. **22**:268 (July) 1939.

The author studied 150 pelves from fetuses at varying gestational ages. He concludes that the fetal pelvis is higher in relation to breadth and depth than is the adult pelvis and that the iliac crest is less curved and has a more anterior position. The angle of divergence is generally smaller than that of the adult pelvis, and the iliac alae are more nearly perpendicular.

ADAIR and POTTER, Chicago.

Newborn

THE PLACENTAL TRANSMISSION OF SULFANILAMIDE AND ITS EFFECTS UPON THE FETUS AND NEWBORN. HAROLD SPEERT, Bull. Johns Hopkins Hosp. **66**:139 (March) 1940.

The administration of sulfanilamide to rats throughout gestation causes it to appear in equal concentrations in the blood streams of the mother and the fetuses.

Prolonged administration of sulfanilamide to pregnant rats produced increased intrauterine and postnatal mortality, decreased the size of litters, diminished the birth weight and caused selective stunting of growth. But it should be noted

that the blood levels of sulfanilamide were much higher than those usually reached in the treatment of human patients, and the administration of the drug was continued throughout gestation, in contrast to the relatively shorter periods of therapy that are usually required clinically.

Until further observations have been made of the effects of sulfanilamide on the human fetus, the drug should be administered with extreme caution during pregnancy. Such observations should include a careful study of intrauterine development, birth weight and postnatal growth in the infants born to mothers receiving extended sulfanilamide therapy during gestation.

LYTTLE, New York.

THE PROTHROMBIN IN THE BLOOD OF NEWBORN MATURE AND PREMATURE INFANTS. KATSUJI KATO and HENRY G. PONCHER, J. A. M. A. **114**:749 (March 2) 1940.

Coagulation tests were made on 100 full term and 73 premature newborn babies by a new procedure. These coagulation tests accurately parallel the prothrombin time. On the first day the average time for the full term babies was forty-three seconds, and that for the premature babies, forty-six seconds. Each showed a tendency to drop to twenty-five seconds at ten days, but the premature babies showed more marked fluctuation. There was no direct correlation between the two.

The increased prothrombin time for normal newborn infants at birth is the basis for hemorrhagic tendencies when it becomes extreme. It may be responsible for intracranial hemorrhage or a factor in it.

The process of coagulation is dependent on several factors, and the absorption of vitamin K and its use through normal hepatic function are necessary for prothrombin activation.

HEERSMA, Kalamazoo, Mich.

EFFECT OF RELATIVE HUMIDITY ON INSENSIBLE WEIGHT LOSS OF THE NEWBORN INFANT. JOHN A. ANDERSON, Proc. Soc. Exper. Biol. & Med. **44**:464 (June) 1940.

By means of an accurately controlled air-conditioned chamber it was possible to determine the insensible loss of weight of unclothed newborn boys at a constant environmental temperature and at relative humidities ranging from 19 per cent to 94 per cent. When sweating did not occur the rate of insensible loss of weight per hour at 20 per cent humidity was approximately twice that observed at 60 per cent relative humidity. Predictions of the energy metabolism from the insensible loss of weight are not valid unless the effect of relative humidity is taken into consideration.

HANSEN, Minneapolis.

PRESENTATION OF A SPASMOPHILIC NEWBORN INFANT: CUTANEOUS CALCIFICATION FOLLOWING INJECTIONS OF CALCIUM GLUCONATE. GERMAIN BLECHMANN, R.-G. LANDRIEU and M. WUEST, Bull. Soc. pédiat. de Paris **37**:230 (April) 1939.

A newborn boy had repeated convulsions. Chvostek's sign was positive. The value for blood calcium was not determined. He was given ten subcutaneous injections of 0.5 cc. and two of 0.25 cc. of calcium gluconate solution, representing a total of 0.5 Gm. of calcium, and 6 Gm. of calcium by mouth, as well as 12,500 international units of vitamin D and five ultraviolet irradiation treatments. Two weeks after the beginning of treatment a hard plaque, about the size of a franc, resembling sclerema, was observed over the right scapular region. Similar areas appeared on the right thigh. Their consistency gave the impression of calcification, and roentgenograms revealed calcium deposits in the plaques. A similar case is quoted in which spontaneous complete resorption of the calcium deposits occurred after four months.

BENJAMIN, Montreal, Canada.

RELATION BETWEEN THE GAS BACILLUS AND MELENA NEONATORUM. A. PRIMNIG, Ztschr. f. Kinderh. **61**:626 (Feb. 17) 1940.

The author reports a case of melena neonatorum in which at postmortem examination the Fränkel-Welch bacillus was cultured from the spleen, and he discusses the possible etiologic relation of the bacillus to melena. He thinks that Bacillus perfringens (normally a saprophyte in meconium), which is identical morphologically and culturally with the Fränkel-Welch bacillus, may change to a pathogenic toxic variant because of the favorable cultural conditions afforded by the bloody intestinal content. After changing to a pathogenic form the bacillus may possibly be infectious for other conditions.

SIEMSEN, Chicago.

AMNIOTIC FLUID IN THE LUNGS OF STILLBORN AND NEWBORN INFANTS. H. YAMAMURA, Jap. J. Obst. & Gynec. **22**:350 (Dec.) 1939.

Evidence of aspirated amniotic fluid was found at necropsy in the lungs of 12 of 24 infants. The lungs of the 7 who were at or beyond term all contained amniotic fluid, while it was present in only 5 of the 17 premature children. The relative infrequency of its presence in the lungs of premature infants is ascribed to insufficient development of the respiratory muscles and early paralysis of the respiratory center. Aspiration pneumonia does not occur unless the amniotic fluid is contaminated by bacteria.

ADAIR and POTTER, Chicago.

Acute Contagious Diseases

ACUTE ANTERIOR POLIOMYELITIS (HEINE-MEDIN DISEASE?) WITH UNUSUAL CEREBRAL MANIFESTATIONS: CLINICAL AND PATHOLOGIC REPORT OF A CASE. RICHARD B. RICHTER, Arch. Neurol. & Psychiat. **42**:1038 (Dec.) 1939.

The author reports an unusual case of anterior poliomyelitis which was characterized clinically by severe and prolonged tenderness and pain of the muscles, papilledema and rapidly failing vision without headache. The microscopic examination of the brain revealed diffuse encephalitis and inflammatory changes in the blood vessels of the nervous system.

BEVERLY, Chicago.

THE LOCAL FORMATION OF ANTIVACCINIAL ANTIBODIES BY THE SKIN. G. HARTLEY JR., J. Infect. Dis. **66**:44 (Jan.-Feb.) 1940.

"Intradermal inoculations of aluminum hydroxide gel cause the mobilization of cells consisting almost entirely of macrophages capable of phagocytosing the gel.

"When small quantities of vaccinia virus (testicular or neural strains) are adsorbed to aluminum hydroxide gel and are inoculated into tissues in which large numbers of macrophages are present, neutralizing antibodies are often demonstrable in extracts of this tissue before they are present in the undiluted blood serum or in other tissues.

"Inasmuch as this tissue consists predominantly of macrophages capable of ingesting aluminum hydroxide gel to which the virus has been adsorbed, the conclusion seems warranted that these neutralizing antibodies are produced by the macrophages in this area."

AUTHOR'S SUMMARY.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **55**:265 (Feb. 16) 1940.

From Dec. 31, 1939 to Jan. 27, 1940 the incidence of influenza was four times that for the corresponding period of the previous year. Poliomyelitis was declining but was still 70 per cent over the seasonal level. Other contagious diseases were below normal. The average mortality from all causes was 12.7 per thousand, which is about normal.

SANFORD, Chicago.

PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES. Pub. Health Rep. **55**:441 (March 15) 1940.

From January 28 to February 24 there was an increase in cases of influenza to two and one-half times the median. There was also a relatively high incidence of poliomyelitis. Other diseases were below the median incidence. The average mortality rate was 13.2 per thousand, which is average. SANFORD, Chicago.

RECENT STUDIES OF EPIDEMIC DIARRHEA AND DYSENTERY. E. L. STEBBINS, South. M. J. **33**:197 (Feb.) 1940.

Stebbins closes his report as follows:

"Bacillary dysentery is endemic in New York State and reported morbidity has increased markedly during recent years. This increase is believed to be due to more complete reporting rather than an actual increase in the disease. The prevalence of dysentery is significantly higher in small villages and in rural areas than in urban areas. . . .

"Inadequate protection of water supplies in summer camps and other resort establishments was found to be the cause of epidemics of dysentery as well as other gastro-intestinal disease.

"Closer supervision of sanitation, particularly water supplies in summer camps, resulted in a decided decrease in epidemics of gastro-intestinal disease."

SCHLUTZ, Chicago.

DIPHTHERITIC INFECTION OF THE UMBILICUS. A. R. THOMPSON, Brit. J. Child. Dis. **36**:171 (July-Sept.) 1939.

Thompson reviews the 65 cases of diphtheritic infection of the umbilicus recorded in the literature. In from 4 to 6 of these the nature of the condition was doubtful. The infection proved fatal in 15 cases, in 5 of which antitoxin was not administered.

The author reports a case of occurrence of the anomaly in a 19 day old girl. The general clinical features, course and appearance of the local lesion all strongly suggested diphtheria; cultures from the local lesion, however, yielded Staphylococcus aureus, diphtheroid bacilli and streptococci. No source of diphtheritic infection could be found. Results of repeated swabs of the fauces, nose, vulva and anus were negative, as were successive cultures of material from the noses and throats of both parents.

The infant was given diphtheria antitoxin even though the clinical diagnosis remained uncertain. She made a successful recovery.

LANGMANN, New York.

INFECTIOUS DISEASES IN 1939. C. DOPTER, Paris méd. **1**:453 (June 3) 1939.

The author provides an extensive review of the literature on infectious diseases published during the past year. The references are given throughout the body of the article. LESLIE, Evanston, Ill.

ECZEMA VACCINATUM. HANS ASPERGER, Wien. klin. Wchnschr. **36**:826 (Sept. 8) 1939.

Hans Asperger (Vienna) reports the fatal case of a 9 month old infant who had suffered for four months with seborrheic eczema. She was hospitalized on account of the outbreak of vesicles and high fever. The clinical picture of eczema vaccinatum was confirmed by laboratory tests of the contents of the vesicles. Further investigation revealed that a 12 year old brother had been vaccinated two weeks before the exacerbation of the sister's eczema. Five days previously a high

fever and a large, running vaccination pustule had developed in the boy, and during these days he had played with the infant.

The infection spread over the child's entire body, and she died on the twelfth day. Fever and a few pustules developed in the mother also, in view of which the author believes that a familial susceptibility to the vaccine virus may have existed. Nevertheless, he recommends vaccination in early life as one way to prevent disorders of this kind.

ABT, Chicago.

ENDEMIC OCCURRENCE OF VARICELLA FOLLOWING HERPES ZOSTER IN CHILDHOOD. W. MATHEJA, Ztschr. f. Kinderh. **61**:153 (Aug. 9) 1939.

The relation between herpes zoster and varicella is unsettled, some writers insisting on a common etiologic agent and others on separate causation. Matheja discusses the arguments pro and con and reports cases of varicella which definitely followed exposure to herpes zoster.

SIEMSEN, Chicago.

"PARARRHYTHMIA" CAUSED BY SCARLET FEVER. P. KISS, Orvosi hetil. **83**:386 (April 22) 1939.

After a light attack of scarlet fever, an arrhythmia developed in a 4 year old child. This arrhythmia can be regarded as "pararrhythmia."

GÖTTCHE, Budapest, Hungary.

DATA ON THE CLINICAL PICTURE OF BACILLARY DYSENTERY. K. CAMMARELLA, Orvosi hetil. **83**:490 (May 20) 1939.

Cammarella, a member of the pediatric clinic at Rome, discusses bacillary dysentery in Italy and emphasizes the fact that the disease is not so rare in Italy as the general public believes. When babies in Italy have diarrhea in the summer, one must always think of the possibility of dysentery, even in sporadic cases.

GÖTTCHE, Budapest, Hungary.

EPIDEMIOLOGIC AND CLINICAL STUDY OF THE 1936 EPIDEMIC OF POLIOMYELITIS IN SLOVAKIA. A. MORES, Bratisl. lek. listy **17**:281 (June); 348 (July) 1937.

The epidemic of 1936 included 135 cases and is contrasted with the 1931 epidemic of 113 cases. The 1936 peak appeared in July, while the peak in 1931 appeared in September. The age incidence coincided in that 50 per cent of the patients were under 3 years of age. This is probably due to the fact that active immunity did not develop in these infants as it did in the older children, through an occult infection. Kolmer observed that the antipoliomyelitis factor was present in 83 per cent of newborn infants and in only 20 per cent of children aged 4 years. No case of infection in the family or the school was found. The meningeal forms are identical with benign lymphatic meningitis. The benign forms seem to have a stormy onset. Convalescent serum was used for only a few patients, and only relatively small amounts of nonconcentrated serum were employed, so that no evaluation is made. Instillation of zinc sulfate is worthy of further study. Establishment of active immunity with the attenuated virus does not seem entirely safe. The important factor at present is education and cooperation of the physician and the public.

STULIK, Chicago.

IS THERE A CONNECTION BETWEEN HERPES ZOSTER, VARICELLA AND SYMPATHETIC OPHTHALMIA? G. VON BAHR, Acta pædiat. **25**:1, 1939.

Herpes zoster in a 5 year old boy was followed by attacks of varicella in the 2 roommates with whom he had been isolated. The 3 patients were under treatment for perforating wounds of the cornea, in each instance involving only one

eye. In the boy who had herpes and in 1 of the 2 "contacts" sympathetic ophthalmia developed. This complication is stated to occur only once in 10,000 cases. Although its appearance in 2 of 3 patients suffering from a coincident traumatic lesion and a virus infection may have been fortuitous, the cases are presented as suggestive evidence of the herpetic origin of sympathetic ophthalmia. Experimental support of this possibility has been obtained by von Szily; Sommer has published 2 comparable cases.

McCUNE, New York.

SCHOOL AND SO-CALLED "SUN DWELLINGS" IN GOTHENBURG DURING AN EPIDEMIC OF SCARLET FEVER (1937 to 1939). N. FAXÉN, Acta pædiat. **25**:51, 1939.

By comparing the influence of the winter vacation on the morbidity rate of scarlet fever in a group of school children, Faxén arrives at the estimate that in 25 per cent of the cases the condition is due to contact in school. The new low cost tenements, "sun dwellings," that have recently been constructed in Göteborg and Stockholm have been blamed for an increase in scarlet fever. Although the concentration of children in these apartments is high, critical analysis of the epidemic that has developed since their erection fails to support the charge.

McCUNE, New York.

STUDIES OF CHICKENPOX ENCEPHALITIS WITH SPECIAL ATTENTION TO THE LATE PROGNOSIS. R. BERGMAN and J. H. MAGNUSSON, Acta pædiat. **26**:31, 1939.

Underwood in 1933 compiled 120 cases of nervous sequels of varicella; of these, 82 had been reported since 1925. The authors have been able to collect 30 additional cases that have been published since 1933; in 28 the nervous involvement was encephalitis. To these they add 10 cases observed in a Stockholm hospital for contagious diseases between 1927 and 1938; no case was observed before the beginning of this period. All of the patients were between 2 and 12½ years of age. The interval between the appearance of the exanthem and the onset of the encephalopathy varied between three and fourteen days, with a mean of approximately six days. The symptoms were predominantly cerebellar, although evidence of disturbance in other parts of the nervous system was not lacking. Meningeal irritation was evident in only 4 cases and was never conspicuous. In only 2 cases were there noteworthy changes in the spinal fluid. Nine patients recovered; 1 died on the sixth day, of clinically and anatomically severe encephalopathy. The complication lasted from seventeen to fifty-three days. Follow-up examination of 4 patients after an interval of eight and one-half to eleven years, of 3 patients after three to four years and of 2 patients nine to ten months after the illness revealed no residual symptoms, either neurologic or psychologic. The 3 patients who had been well longest were leading entirely normal lives.

This is a good paper; it presents a useful bibliography.

McCUNE, New York.

NERVOUS COMPLICATIONS OF SCARLET FEVER. S. ECKERSTRÖM, Acta pædiat. **26**: 112, 1939.

The author describes 3 cases of what he regards as organic nervous complications of scarlet fever. The findings are clearly capable of divers interpretations as regards pathogenesis and constitute at most a feeble contribution to the subject.

McCUNE, New York.

INFLUENCE OF THE ENVIRONMENT ON THE TEMPERATURE CURVE IN INFECTIOUS DISEASES. N. FAXÉN, Acta pædiat. **26**:146, 1939.

The striking discrepancies in the degree of febrile reaction of different children to infections of apparently similar severity are ascribable to many factors; among these constitutional predisposition is regarded to be important. By "constitution"

is meant the inborn and environmental influences that modify the phenotype. In some circles the neuropathic child is thought to show an unusual predisposition to hyperthermia, although this suspicion has never been verified. Acting on the postulate that first-born children and only children are more apt to be neuropathic than others, Faxén conducted a statistical investigation into the febrile response of 1,789 children to infection with scarlet fever. In this manner he was able to verify to his own satisfaction the correctness of the impression mentioned.

McCune, New York.

Wassermann, Kahn and Sachs-Georgi Reactions in Scarlet Fever. A. Landau, Acta pædiat. **26**:235, 1939.

In 164 cases of scarlet fever in which a Wassermann test was carried out during the acute stage of the disease, in 117 cases in which the test was repeated after an interval of from two to four weeks following the illness and in 47 cases in which the reaction was performed three weeks after scarlet fever only 1 positive reaction was encountered. This disproves the assertion that the Wassermann test frequently becomes positive during scarlet fever. The Kahn reaction and the Sachs-Georgi reaction gave no evidence of being disturbed by scarlet fever.

McCune, New York.

Nervous Complications of Mumps. E. Linde, Acta pædiat. **26**:268, 1939.

The involvement of the central nervous system by the virus of epidemic parotitis has received widespread recognition. However, there is some lack of appreciation of the extreme diversity of the clinical syndromes that can result from this species of infection. The classic chain of events is an attack of mumps followed by meningoencephalitis; occasionally symptoms of involvement of the central nervous system may precede the parotid swelling. A special group of conditions has been revealed by systematic lumbar puncture of patients with apparently uncomplicated mumps; in many instances the spinal fluid shows deviation from normal, thereby affirming the existence of subclinical involvement of the cerebrospinal axis. A third group exists in which the meningitis is clinically manifest but in which the parotitis ether is inconspicuous or fails to appear. These conditions are recognized by their occurrence during an epidemic in persons who have been exposed to the disease and who become ill at an appropriate time after exposure. Linde reports cases illustrative of these several types; 1 fatality is recorded. Autopsy revealed massive edema and vacuolar degeneration of the nerve fibers of the cerebral cortex.

McCune, New York.

Is the Higher Incidence of Infantile Paralysis in Rural Districts Real or Apparent? W. Wernstedt, Acta pædiat. **26**:489, 1939.

In previous publications the author has drawn attention to the fact that during the epidemic of poliomyelitis that occurred in Sweden during 1911, 1912 and 1913 the incidence of the disease was higher in the rural districts than in the cities. He has also pointed out that in the sparsely populated areas more older children and adults were attacked than young children, whereas in the crowded urban communities the opposite relation was encountered. The objection has been advanced that this bare statement of fact contains misleading implications, as it fails to take account of the difference between the population of the city and that of the country with respect to the age of their members. Wernstedt counters by showing that this factor was considered in his original statement of the case: Analysis of the composition of the two populations according to age provides additional support for what was implied in the original assertion. The rebuttal is elaborated in considerable detail. Whether the phenomenon may be expected to repeat itself is conceded to be an open question. The results of analysis of the epidemic of 1938 are awaited with interest.

McCune, New York.

Acute Infectious Diseases

IMMUNIZATION AGAINST RHEUMATIC FEVER WITH HEMOLYTIC STREPTOCOCCUS FILTRATE. V. P. WASSON and E. E. BROWN, Am. Heart J. **20**:1 (July) 1940.

Inoculation with hemolytic streptococcus filtrate of patients with rheumatic fever lessened the number of recurrences of rheumatic episodes as compared to the number observed in a group of rheumatic children who did not receive the inoculations. The average age of the treated children at the beginning of treatment was 12.9 years. Two control groups were used, the average ages being 9 and 11 years. It would seem that the difference in age between the treated and the control subjects should be taken into consideration in evaluating the results.

GIBSON, Chicago.

TRISODIUM ARSPHENAMINE SULFONATE (TRISODARSEN) IN THE TREATMENT OF CONGENITAL SYPHILIS. T. B. GIVAN and G. VILLA, Am. J. Syph., Gonor. & Ven. Dis. **23**:771 (Nov.) 1939.

Trisodarsen is a trivalent compound which is chemically known as trisodium arsphenamine sulfonate.

Stokes and Beerman were the first to report on this drug, confining their work to cases of early acquired syphilis.

This report deals with a clinical study of the drug in cases of congenital syphilis. The majority of the patients received the drug intravenously, though some were treated intramuscularly. No local reactions were observed. Trisodarsen was relatively well tolerated. Mild reactions, such as nausea and vomiting, occurred, as well as slight cutaneous eruptions in 3 cases and dermatitis exfoliativa in 1 case. Nitritoid reaction was observed in 1 case. No fatality occurred. Patients who had reactions after the administration of neoarsphenamine received trisodarsen without any ill effects.

The drug proved to be effective in the treatment of the various manifestations of congenital syphilis, as well as in producing a negative Wassermann reaction in 76 per cent of 121 patients who had had a positive reaction before treatment.

REUTER, Milwaukee. [ARCH. DERMAT. & SYPH.]

GUINEA PIG INOCULATION WITH THE GASTRIC CONTENTS OF TUBERCULOUS CHILDREN. E. ROSENCRANTZ and SAMUEL HURWITZ, Am. Rev. Tuberc. **41**: 645 (May) 1940.

Pulmonary tuberculosis may be present in infants and young children without any local or constitutional disturbances whatsoever. The finding of the tubercle bacillus gives undisputed evidence of the presence of this condition. It is of great importance, therefore, to determine the presence of this organism in those suspected of harboring the disease. Children almost invariably swallow their sputum; hence the invading organisms are most likely to be found in the contents of the stomach. For discovering the presence of the bacillus guinea pig inoculation is a much more accurate method than staining or cultural procedures. The method used by the authors in 169 consecutive cases is described in detail.

The majority of the children in these cases were 10 years old or less, but 35 were over this age. Physical signs were present in only 30 per cent and clinical symptoms in 50 per cent. In 95.3 per cent there was roentgen evidence of tuberculous disease. In this group tubercle bacilli were found in 76, or 45 per cent. The younger the group, the higher were the percentages of positive findings, up to the age of 5 years, when the number decreased. The findings varied with the character of the disease. In all 4 cases of acute miliary tuberculosis the gastric contents yielded the bacilli; of 38 cases of pulmonary infiltration, the bacilli were

found in 92 per cent; of 12 cases of pleural effusion, in 58 per cent; of 26 cases of primary tuberculosis with calcification of either the parenchyma or the hilus node, in 27 per cent; of 66 cases of the hilus node involvement only, in 25 per cent. In all of 6 cases of extrapulmonary tuberculosis the bacillus was found.

The possible significance as a source of infection of the frequent occurrence of tubercle bacilli in the gastric contents of the tuberculous child is discussed.

EUGENE H. SMITH, Ogden, Utah.

PROTECTION AGAINST RABIES. JAMES M. MOSS, J. Lab. & Clin. Med. **25**:702 (April) 1940.

Single daily doses of vaccine made by the Harris method resulted in an earlier response and a longer duration of immunity than did immunization by other methods tested.

READING, Galveston, Texas.

ATAXIA DUE TO BITE OF AMERICAN DOG TICK (DERMACENTOR VARIABILIS SAY). PHILIP A. MULHERIN, J. Pediat. **16**:86 (Jan.) 1940.

A case is reported of generalized ataxia and asynergia in a 7 year old white girl, with recovery in three or four days. A female dog tick was found embedded in the top of the child's scalp and was removed. Laboratory evidence suggests that this disease is due to a venom elaborated in the developing ova of an impregnated female tick. The disease does not appear to be an infection. It is not caused by the male tick. Numerous deaths have been recorded, but there have been no autopsy reports. The onset of this disease is sudden, and it progresses rapidly to death unless the cause is removed. Fever is usually absent. Irritability and fatigue may precede by a day or two the symptoms of ataxia and asynergia. Paresthesia is common. Weakness of the muscles extends rapidly to complete flaccid paralysis, The paralysis begins in the legs and extends upward, involving the trunk, the arms and the muscles of deglutition and speech. Death occurs from respiratory paralysis. When the tick is removed recovery is dramatic and usually complete in three or four days, as in the case reported.

RAUH, Cincinnati.

STUDIES IN TUBERCULOSIS: I. THE INCIDENCE OF TUBERCULOSIS INFECTION IN AND ABOUT SYDNEY, NEW SOUTH WALES, AS SHOWN BY THE INTRACUTANEOUS TUBERCULIN TEST. DOUGLAS ANDERSON, M. J. Australia **1**:747 (June 1) 1940.

A tuberculin testing survey of some 7,000 persons in Sydney, Australia, reveals that there is a somewhat lower incidence of tuberculosis than in comparable cities of the old world. Infection takes place far earlier in children from tuberculous families than in others. In general there is a later onset of infection than there was fifteen years ago. Whether or not this will result in greater or less tuberculous disease cannot be determined yet. Generally speaking, there is a higher incidence among men than among women.

TENNEY, Madison, Wis.

FIRST REPORT OF THE BACILLUS OF SCHMITZ IN CASES OF INFANTILE DYSENTERY IN ROME. C. CAMMARELLA and G. RITA, Lattante **11**:87 (March) 1940.

The bacillus of Schmitz was first isolated in 1917, in an epidemic of dysentery among prisoners of war. The organism does not ferment lactose or mannite and does produce indole. It is agglutinated by a serum of its own but not by the serums of Shiga's bacillus or other types of dysentery bacilli.

The organisms of Schmitz were isolated from the stools of 3 infants (9 and 10 months of age) with dysentery. Identification was made by cultural and agglutination tests.

HIGGINS, Boston.

FOUR CASES OF MALARIA OCCURRING IN INFANTS DURING THE FIRST DAYS OF LIFE. G. MARIA DORE, Riv. di clin. pediat. **38**:203 (April) 1940.

In 1 infant estivoautumnal malaria developed at the age of 8 days; the mother had malaria also; this occurred during the nonmalarial season, when anopheles mosquitoes were not active. That the malaria of the infant was congenital seems almost certain.

Estivoautumnal malaria developed in the second infant at the age of 10 days; the mother also had malaria. In this case the disease developed during the malarial season; while congenital malaria is probable, one can not be certain that the infant had not been bitten by an infected mosquito.

The other 2 infants were twins, who at the age of 2 days received injections of blood taken from their mother, who proved to have malignant tertian malaria. Ten days later febrile attacks appeared in the infants. The injected blood was probably the cause of the malaria.

Three of the infants showed complete recovery after quinine therapy, while 1 of the twins died.

HIGGINS, Boston.

CONGENITAL SYPHILIS WITH DEVELOPMENT OF INTERSTITIAL KERATITIS AFTER TRAUMA: REPORT OF TWO CASES. N. GORCHAKOV and I. GORCHAKOV, Vestnik oftal. **15**:94, 1939.

In 2 children, aged 9 and 8 years, whose Wassermann reaction and also that of their mothers was 4 plus, parenchymatous keratitis developed in one eye after trauma. A review of the literature on the subject is given. The Gorchakovs accept the Vignol-Lutati theory that trauma weakens the local immunity of the cornea and aids proliferation of the previously latent Spirochaeta pallida.

O. SITCHEVSKA. [ARCH. OPHTH.]

Chronic Infectious Diseases

CASE FINDING IN SCHOOLS AND UNIVERSITY. J. W. STRAYER, Am. Rev. Tuberc. **41**:124 (Jan.) 1940.

The procedures used in this examination of Indiana school and university students were the Pirquet test during the first part of the study and the Mantoux test for the subsequent period. Roentgenograms were taken of all positive reactors. In all, 15,111 school children ranging in age from 5 to 19 years and 8,920 university freshmen were tested. The incidence of primary tuberculosis was found to range from 6.1 per cent at the age of 6 years to 31.4 per cent at the age of 20. Thirty-five cases of the reinfection type of tuberculosis were found among 24,035 persons. None were observed among persons between the ages of 5 and 11 years.

EUGENE H. SMITH, Ogden, Utah.

VALUE OF THE TUBERCULIN PATCH TEST IN CASE FINDING. HERMANN VOLLMER, J. Pediat. **16**:627 (May) 1940.

Three groups of children, totaling 2,000, were tested with the tuberculin patch test and the Mantoux test. The first group comprised 847 children admitted to the hospital. In only 1 case in which the clinical, roentgen and bacteriologic picture of a tuberculous infection was seen did the patient fail to show a positive reaction to the patch test; this patient was a child with miliary tuberculosis in whom the Mantoux test with 1 mg. of old tuberculin gave a negative reaction. Among a group of 535 children in a hospital for tuberculosis, 6 failed to react to the patch test. Four of these were known to be "negative anergic." The infection in 2 cases was really missed by the patch test. The Mantoux and patch

tests and roentgen examinations were done on 613 high school students. No significant lesions were missed if patients failed to react to either the patch or the Mantoux test. Among 2,000 children, including 763 positive reactors to tuberculin, 3 children with active tuberculosis were missed by the patch test. Vollmer summarizes the literature on the patch test. In general the investigators report results in agreement with those reported by him. In order to avoid too strong reactions to the patch test in cases of active tuberculosis, a preliminary test can be carried out, which is applied for only six to twenty-four hours instead of forty-eight hours.

RAUH, Cincinnati.

STUDIES IN TUBERCULOSIS: V. THE INTENSITY OF THE TUBERCULIN REACTION AND ITS RELATIONSHIP TO THE FREQUENCY OF RADIOLOGICALLY RECOGNIZABLE TUBERCULOSIS IN APPARENTLY HEALTHY YOUNG ADULTS. D. ANDERSON, M. J. Australia **1**:861 (June 22) 1940.

Using only 0.025 cc. of the usual second strength solution of the purified protein derivative of tuberculin, Anderson found that in apparently healthy young adults (300 subjects) reaction to the test with ecchymosis or vesiculation was relatively frequently associated with roentgen evidence of former tracheobronchial lymphoglandular tuberculosis and that reaction with a raised area greater than 10 mm. in diameter was relatively frequently associated with roentgen evidence of tuberculous processes, latent or active, in the pulmonary parenchyma. He found also that in apparently healthy young adults with no family history of tuberculosis who reacted weakly to the test roentgen evidence of such processes was relatively uncommon.

GONCE, Madison, Wis.

ADVANTAGES OF THE "IDE REACTION" IN PEDIATRICS. E. GRANATA, Med. ital. **21**:9 (Jan.) 1940.

The author describes the technic of the Ide reaction and reviews the results obtained by other authors. The blood of 500 persons was tested. The test was used on whole blood and also on blood serum. Most of the subjects were congenitally syphilitic. The results were compared with those obtained with the Wassermann reaction and the Meinicke reaction. The author concludes that the Ide reaction is very sensitive and is superior to the others. The reaction carried out on whole blood is slightly less sensitive than that carried out on the serum. The nonspecific reactions were 0.4 per cent. The reaction can be carried out on a very small quantity of blood, which may be obtained by pricking the finger. The technic is simple; the result is easy to read, and the cost is very small. All these make this an ideal test for the pediatrician.

MARTOCCIO, Utica, N. Y.

TREATMENT OF SYPHILIS IN CHILDREN. HERMILO CASTANEDA, Rev. mex. de puericult. **9**:93 (Jan.) 1939.

The author gives a good general review of the treatment of syphilis in children. He discusses the various drugs as to indications, doses and contraindications.

HERRON, Oak Ridge, La.

SO-CALLED POSITIVE ANERGY. G. ANZÉN, Acta pædiat. **26**:12, 1939.

Persons who have not been infected by the tubercle bacillus do not react to tuberculin. Lack of reactivity is also encountered in certain cases of overwhelming tuberculous infection and classically in miliary tuberculosis and tuberculous meningitis; this occurs also in states of cachexia and during the course of many acute infectious diseases. In addition, some patients suffering from febrile but benign tuberculosis fail to react, exhibiting what Jadassohn has designated as specific

positive anergy. Finally, lack of reactivity may occasionally reappear with the complete healing of tuberculosis. As a probable example of this last phenomenon Anzén cites the case of a 12 year old girl who gave positive reactions to both Pirquet and percutaneous tests during an attack of erythema nodosum in 1933 but gave a negative reaction to 5 mg. of tuberculin on intracutaneous testing in 1938. The tuberculous nature of the erythema nodosum received support but not incontrovertible proof from roentgen abnormalities in the lungs.

McCune, New York.

Medical Examination of School Children to Detect Tuberculosis: A Patholoic, Geographic, and Sociologic and Hygienic Study. E. Forsgren, Acta pædiat. **26**:158, 1939.

The author describes the details of a campaign to determine the incidence of tuberculous infection among the rural inhabitants of northern Sweden. The results of tuberculin tests are recorded and discussed briefly.

McCune, New York.

An Epidemic of Tuberculosis of Bovine Origin Involving the Inhabitants of a City and of a Summer Camp for Children. A. Gnosspelius, Acta pædiat. **26**:194, 1939.

The author describes an epidemic of tuberculosis due to the consumption of nonpasteurized milk which jeopardized the health of 136 members of 33 families in the city of Göteborg. One hundred members were examined, and 98 gave positive reactions to tuberculin; only 2 infants who had been fed at the breast failed to react. Of the positive reactors, 23 had been unquestionably infected by the contaminated milk. At least 17 children among 42 residents of a summer home were infected through the same source. New statutes have been promulgated to avoid repetition of the catastrophe.

McCune, New York.

Acute Polyarthritis as the Initial Symptom of Primary Tuberculous Infection. J. Heimbeck, Acta pædiat. **26**:206, 1939.

A 21 year old woman suffered an attack of what appeared to be acute rheumatic fever. A routine Pirquet test gave negative results. Repetition of the test six weeks later elicited a strongly positive reaction. Shortly thereafter there was an attack of pleurisy; roentgen examination revealed the presence of a tuberculous focus in the lungs. The subsequent course of the infection was benign. The long-debated relation of transient arthritis to tuberculosis is discussed. Although the once popular concept of Poncet is rejected and the work of Loewenstein is depreciated, the conclusion is drawn that arthritis, presumably of allergic origin, may herald the onset of a tuberculous infection.

McCune, New York.

A Difference in the Behavior of the Pirquet Test in Children and in Adults. G. Herlitz, Acta pædiat. **26**:221, 1939.

To investigate the reliability of his impression that deferred positive reactions to tuberculin are somewhat more common in adults than in children, Herlitz performed the Pirquet test on 293 first-grade school children aged 7 years and 129 adults whose median age was 68 years. In the case of the children who reacted positively (15.4 per cent of the total) the lesion exhibited maximal development at forty-eight hours. After seven days, 8 adults who had shown no reaction at the time of the initial reading were found to react positively. Although the small size of the two series moves the author to disclaim statistical reliability for the observation, there are many general reasons why the adult skin might be expected to react less rapidly to tuberculin than that of the child.

McCune, New York.

Diseases of Blood, Heart and Blood Vessels and Spleen

PERSISTENT OSTIUM ATRIOVENTRICULARE COMMUNE IN A HEART WHICH FUNCTIONED AS A BILOCULATE ORGAN. J. E. BENJAMIN, HARRY LANDT and PEARL ZEEK, Am. Heart J. **19**:606 (May) 1940.

The authors report a case of persistent ostium atrioventriculare commune in a heart which functioned as a biloculate organ. The patient was followed from the age of 7 years until her death at the age of 18. Although she was extremely cyanotic, she lived in relative comfort and was able to engage in some physical activity. No case could be found in the literature in which the length of life approached that of the patient reported on. GIBSON, Chicago.

SPLENECTOMY IN THE TREATMENT OF BANTI'S SYNDROME. E. H. BARG and J. W. DULIN, Arch. Surg. **41**:91 (July) 1940.

The authors reviewed the cases of 43 patients who fulfilled the requirements for a diagnosis of Banti's syndrome. Six were under 16 years of age. Half were treated by splenectomy, and the remainder were treated conservatively. A comparison of the two groups was made in an effort to determine the effects of the splenectomy. Six of the 21 patients conservatively treated were alive two and one-half years after the diagnosis was made. The operative mortality for 22 patients was 27 per cent. It was felt that the duration of life was prolonged after splenectomy and that ascites was generally relieved. Splenectomy is the treatment of choice and should be performed in the early stages.

KAISER, Rochester, N. Y.

FIFTEEN YEARS' OBSERVATION OF CHILDREN WITH RHEUMATIC HEART DISEASE. WILLIAM D. STROUD and PAUL H. TWADDLE, J. A. M. A. **114**:629 (Feb. 24) 1940.

Six hundred and eighty-five children observed during a fifteen year period were treated for rheumatic heart disease. This group was studied particularly to evaluate the results of institutional care and treatment and to observe the course of the disease. Apparently acute rheumatic infection is less liable to recur after puberty, and pregnancy is tolerated well. Negroes are relatively resistant to the infection. Observations as to seasonal incidence, causes of death, occupational status and other prognostic factors are charted. HEERSMA, Kalamazoo, Mich.

A METHOD FOR THE DETERMINATION OF SUGAR IN SMALL AMOUNTS (0.02 CC.) OF BLOOD. NIELS KLENDSHOJ and ROGER S. HUBBARD, J. Lab. & Clin. Med. **25**:1102 (July) 1940.

The authors describe a method for determining values for blood sugar with small amounts of blood. Their method uses only 0.02 cc., as compared to the 0.1 cc. used in other micromethods. They present figures showing that this method gives determinations which closely agree with the results of duplicate analyses done by the method of Folin and Wu. The authors feel that this method may have a great deal of use in a pediatric practice. GARD, Galveston, Texas.

IDIOPATHIC LIPEMIA WITH SECONDARY XANTHOMATOSIS, HEPATOSPLENOMEGALY, AND LIPEMIC RETINALIS. MAX GOODMAN, HAROLD SHUMAN and SOLL GOODMAN, J. Pediat. **16**:596 (May) 1940.

A case of a 1 year old infant with lipemia, hepatosplenomegaly, lipemia retinalis and xanthomatosis is presented. A detailed analysis of the serum lipids showed that the neutral fats were markedly elevated, whereas the phospholipids and total

cholesterol were only slightly elevated. No serum lipase was present. The authors discuss the physiologic factors which control fat metabolism and the pathogenesis of lipemia in the diseases in which it occurs. RAUH, Cincinnati.

CHANGES IN ARTERIAL PRESSURE AFTER BILATERAL COMPLETE OR PARTIAL URETERAL OCCLUSION. R. S. MEBIBOW, L. FRIEDBERG, S. RODBARD and L. N. KATZ, Proc. Soc. Exper. Biol. & Med. **43**:245 (Feb.) 1940.

Six of 7 dogs with bilateral ureteral occlusion had increases in the blood pressure to hypertensive levels which persisted until death by uremia one to five days later. Five of 7 dogs with partial occlusion of the ureters had an increase in the blood pressure to hypertensive levels. HANSEN, Minneapolis.

INTRAVENOUS ADMINISTRATION OF BOVINE AND HUMAN PLASMA TO MAN: PROOF OF UTILIZATION. O. H. WANGENSTEEN, HARRY HALL, A. KREMEN and B. STEVENS, Proc. Soc. Exper. Biol. & Med. **43**:616 (April) 1940.

From a study of 7 patients suffering from some type of cancer and thereby presenting some of the effects of protein starvation, it was found that intravenously administered human plasma is retained and utilized. One patient who had been given 450 cc. of plasma for a five day period was maintained in positive nitrogen balance. From these studies it appears that human plasma is a better agent than whole blood to maintain nitrogen equilibrium in starvation states. A number of studies in which bovine plasma was substituted for human plasma are also mentioned in this paper. Of 66 patients given small amounts (2 to 10 cc.) of bovine plasma, reactions were noted in 15 per cent. In a number of instances bovine plasma was given in larger amounts, and from these experiments the authors conclude that plasma of this type given to human subjects is retained and apparently utilized. HANSEN, Minneapolis.

EFFECT OF SYNTHETIC VITAMIN K COMPOUNDS ON PROTHROMBIN CONCENTRATION IN MAN. P. M. AGGELER, S. P. LUCIA and LEON GOLDMAN, Proc. Soc. Exper. Biol. & Med. **43**:689 (April) 1940.

Hypoprothrombinemia in 26 patients was treated with three synthetic naphthoquinones (vitamin K). After treatment the prothrombin concentration was markedly elevated in 11 patients with obstructive jaundice and not elevated or only slightly so in 11 patients with chronic disease of the liver. Of 2 patients with acute disease of the liver the concentration was increased in 1.

HANSEN, Minneapolis.

STUDIES ON STORED BLOOD: RESULTS IN A SERIES OF FOUR HUNDRED AND TWENTY-SEVEN TRANSFUSIONS. C. P. STEWART, Edinburgh M. J. **47**:441 (July) 1940.

For treatment of severe hemorrhages and other emergencies, as well as for war practice, storage furnishes the only feasible means of providing adequate amounts of blood at all times.

In normal practice the two chief considerations are prevention of reactions and obtaining the maximal therapeutic benefit from the transfused blood. Stewart found that the storage of blood, if not prolonged for more than fourteen days, does not produce an increase in the incidence of reactions. There are fewer reactions if blood is not used after storage for more than five to ten days.

For purposes of increasing the defense mechanism by transfusion there is the necessity in certain cases to furnish viable leukocytes, and the blood therefore should not be given after two days of storage. NEFF, Kansas City, Mo.

ANGIOMATOSIS. ROBERT KLABER, Proc. Roy. Soc. Med. **33**:581 (July) 1940.

A patient, aged 22 months, showed large distended veins in the right side of the chest, right arm and right hand a few days after birth, and the condition had not changed. On the right hand and arm they appeared to form subcutaneous tumor-like masses. The mother thought that the arm was sometimes painful. Elevation of the arm resulted in a considerable degree of emptying. The case was presented chiefly to obtain opinions as to whether any form of treatment was necessary. Irradiation, injections of sclerosing solutions and subclavian ligation had been considered, but no treatment had been instituted.

WILLIAMSON, New Orleans.

A MICROMETHOD FOR DETERMINING THE CALCIUM IN BLOOD PLASMA. EINAR JOSEFSSON, Rev. franç. de pédiat. **15**:417, 1939.

A method is described for determining the level of blood calcium with 0.1 cc. of plasma.

LESLIE, Evanston, Ill.

A CASE OF ERYTHROBLASTIC ANEMIA IN A CHILD OF SEVENTEEN MONTHS. ANTONIO DI BARTOLO and GIVELERMO A. BOGANI, Infancia **1**:297, 1937.

The authors present in detail the laboratory data on an infant with erythroblastic anemia, together with roentgenograms of the skull and of the long bones.

HERRON, Oak Ridge, La.

A CASE OF SCHOENLEIN-HENOCH PURPURA IN AN INFANT. L. ACERBI, Med. ital. **20**:503 (Oct.) 1939.

A 10½ month old infant with purpuric spots on the gluteal region and the lower extremities is presented. There was edema of the ankles, and movement of the ankles seemed to cause pain. In the left side of the cervical region there was a soft swelling the size of a walnut. The pharynx was markedly reddened, and the tonsils were hypertrophic. The Wassermann and tuberculin reactions were negative. The temperature was 38 C (100.4 F.). The urine showed a trace of albumin, numerous red blood cells, some granular casts and an occasional (rare) leukocyte. On the fourth day in the hospital there appeared papules and urticarial wheals, which on the following day became hemorrhagic. The temperature rose to 39.6 C. (102.2 F.). The infant made a good recovery. The day after discharge the infant returned with an exacerbation of the hemorrhagic picture. Recovery took place again in one week. The author concludes that this could not have been caused by anaphylactic reaction but was due to a toxin from the breakdown of proteins in the intestinal tract.

MARTOCCIO, Utica, N. Y.

ACETONE BODIES IN THE BLOOD OF INFANTS—EXPERIMENTAL STUDY OF THEIR PATHOGENESIS. E. SCHWARZ, Med. ital. **20**:521 (Nov.) 1939.

The author describes the method of Cantoni for determining the concentration of acetone bodies in the blood. He studied the effect of a brief fast on the blood sugar and the acetone bodies in 10 infants and the effect of a ketogenic diet on 10 other infants. He concludes that there is an acquired or constitutional predisposition to acidotic states, shown by the appearance in the blood of some infants of acetone bodies after a twelve hour fast. A high fat diet, amino acids, ammonium chloride and sodium butyrate can cause acetone bodies in the blood.

MARTOCCIO, Utica, N. Y.

A CASE OF ACUTE MYELOID LEUKEMIA WITH AN INITIAL ERYTHROBLASTIC STAGE. F. TECILAZIC, Pediatria **47**:593 (July) 1939.

A child of 6 years was observed in the hospital suffering from scarlet fever. In the second week of her illness she had arthritis of both knees. The red blood cells numbered 3,300,000 per cubic millimeter, and the value for hemoglobin was

50 per cent. The white blood cell count was 11,000 per cubic millimeter. The blood smear was normal. The child had fever for the first eight days of her illness and at the time of the arthritis. She was discharged well and returned in eight days with tonsillar diphtheria. The red blood cells at this time numbered 1,200,000 per cubic millimeter, and there were a large number of erythroblasts in the smear. The granulocytes were decreased. Sixteen days after onset there appeared in the circulation immature cells of the granulocytic series. A diagnosis of myeloid leukemia was made. The child died on the thirty-third day of the illness. Autopsy observations are reported.

MARTOCCIO, Utica, N. Y.

THE TAKATA-ARA REACTION OF THE BLOOD SERUM IN SOME DISEASES OF INFANTS. A. M. CAVALLOTTI, Pediatria **47**:770 (Sept.) 1939.

The author describes the technic of performing the Takata-Ara test and reading the reaction. He concludes that the reaction is a test of hepatic function. It is more often positive in patients with chronic disease of the liver. It is also of importance in cases of chronic nutritional disease and in exudative diatheses. The reaction is negative in the presence of acute intestinal disease. It is positive in the presence of acute diseases of the upper respiratory tract.

MARTOCCIO, Utica, N. Y.

THE FEEDING OF INFANTS WITH CARDIAC LESIONS. DELIO AGUILAR GIRALDES, An. Soc. puericult. Buenos Aires **4**:23 (Jan.-March) 1938.

The authors present 7 cases of congenital heart disease in which there were varying degrees of involvement. Some infants seem to do well with artificial feedings, and others do not. All were given artificial feedings of various types.

HERRON, Oak Ridge, La.

ETIOLOGY AND THERAPY OF COOLEY'S ANEMIA. K. CHOREMIS and G. SPILIOPULOS, Jahrb. f. Kinderh. **148**:317 (March) 1937.

The authors claim that the clinical syndrome called Cooley's anemia, which occurs characteristically in Italian, Greek and Syrian stock, is a result of malaria. They state that there is either a congenital malarial infection or a transmitted predisposition of the blood-building organs to different toxic factors, which when they act can set up the syndrome known as Cooley's anemia.

Several reports are given of cases of Cooley's anemia in which the patients received intensive antimalarial therapy with good results.

LANDAU, Hannibal, Mo.

A CASE OF HIGH GRADE ALIMENTARY HEPATOGENOUS FAT RETENTION IN THE BLOOD OF AN ELEVEN YEAR OLD CHILD. WALTER ABEGG, Jahrb. f. Kinderh. **149**:94 (May) 1937.

An 11 year old girl is described, who had abnormal deposits of fat in her skin, mucous membranes and skeleton. In addition, she had an enlarged spleen. There was an enormous increase in total blood lipids. With the patient on a diet free of fat the blood returned to normal and the spleen approached normal size. This condition was classed as essential hypercholesteremia with xanthomatosis and was designated as an example of alimentary hepatogenous fat retention in the blood.

LANDAU, Hannibal, Mo.

AN EXPERIMENTAL INVESTIGATION OF PERIARTERITIS NODOSA (GUINEA PIG INOCULATION IN TWO CASES IN WHICH THE CONDITION WAS DIAGNOSED DURING LIFE). G. HERLITZ, Acta pædiat. **25**:135, 1939.

Four guinea pigs were inoculated intraperitoneally with the blood serum from 1 adult patient with periarteritis nodosa and 2 guinea pigs with the blood of another. The animals died or were killed at varying times afterward; none showed

the lesions of the disease. The experience contradicts von Hann's report of successful transmission of periarteritis nodosa to guinea pigs.

McCUNE, New York.

MACROCYTIC HYPERCHROMIC ANEMIA IN CHILDREN: REPORT OF A CASE. J. H. MAGNUSSON and B. HAMNE, Acta pædiat. **25**:189, 1939.

The summary states: "The authors describe a case of macrocytic hyperchromic anemia in celiac disease in a girl of 8½ years who, five years earlier, presented a clinical picture typical of celiac disease combined with anemia. A likely cause of the disease picture in this case is a paratyphoid infection incurred in early infancy (the first half of the second month). This paratyphoid fever (Breslau) was of long duration with positive bacillus findings in the feces for six months."

McCUNE, New York.

A CASE OF ESSENTIAL THROMBOPENIA. S. LANGERT, Acta pædiat. **26**:242, 1939.

After discussing idiopathic thrombopenic purpura the author describes a case of the chronic condition of eleven years' duration in a child. A ten-year cure was accomplished by splenectomy.

McCUNE, New York.

FAMILIAL EOSINOPHILIA. N. MALMBERG, Acta pædiat. **26**:277, 1939.

Approximately 11 instances have been recorded in which several members of a family showed an unexplained persistent increase in the eosinophilic leukocytes of the blood. Malmberg adds an additional observation on a family in which eosinophilia was demonstrated in the mother and 3 children. The participation of familiar causes of eosinophilia, such as allergy and helminthiasis, was excluded.

McCUNE, New York.

SOME REMARKS ON THE PHYSIOLOGIC RED BLOOD PICTURE DURING THE FIRST YEAR OF LIFE. Y. ÅKERRÉN, Acta pædiat. **26**:502, 1939.

The author philosophizes on the drop in the concentration of hemoglobin and in the red blood cell count shown by Williamson, Mackay, Faxén and others to be characteristic of the first few months of life.

McCUNE, New York.

Diseases of Nose, Throat and Ear

THE "HEAD COLD" IN INFANCY AND CHILDHOOD—A NEW METHOD OF TREATMENT. MEYER O. CANTOR and HARRY S. BERMAN, J. Michigan M. Soc. **39**:33 (Jan.) 1940.

This article describes a suction method for cleansing the nose of mucous secretions.

The technic and its advantages are discussed.

CAREY, Detroit.

PEDIATRIC TREATMENT OF THE ACUTE EAR. NORMAN WARD CLEIN, Northwest Med. **39**:135 (April) 1940.

The author points out the difference between pediatric management and otologic treatment of otitis. The objectives of treatment in cases of infection of the upper respiratory tract are: (1) prevention of the spread of the infection to the ears, (2) conservative medical treatment of the inflamed ear, (3) paracentesis if necessary and (4) careful observation and patience in treating the complications that may arise from a draining ear.

Sulfanilamide treatment decreases the duration of the discharge by one half to one fourth, as compared with the customary treatment.

Sulfapyridine seems to be more effective in some of the cases in which a ready response to sulfanilamide is not obtained.

The author states that in the past two years, since sulfanilamide has been available, he has not had a single case in his private practice in which he felt it necessary to institute surgical treatment of the mastoid. ROBERTSON, Omaha.

THE SCHILLING HAEMOGRAM IN OTITIS MEDIA AND MASTOIDITIS OF INFANCY. EDWARD C. ROSS COUPER, Arch. Dis. Childhood **15**:27 (March) 1940.

Ordinary white blood cell counts and differential counts are of no value in prognosis or differential diagnosis. Analysis of the polymorphonuclear cells on the lines suggested by Schilling and others is applicable to infants of this age group. The use of some index of "left shift," such as the multiple index employed in the present series, is possibly of diagnostic value and certainly of prognostic value. Single counts are not nearly so useful as a series of estimations. The height of the multiple index is of no value as an indication of the time to operate, for each infant's response to the infection varies, and such counts must always be considered in conjunction with the clinical condition. An infant's weight has long been regarded as a good indication of its progress, and the manner in which the multiple index rises with loss of weight and falls with gain in weight is striking. As the multiple index and kindred indexes are established as reliable indexes of infection somewhere in the body and as the multiple index in the present series fell and rose according to the success or nonsuccess of treatment directed against the aural infection, it seems reasonable to conclude that the aural infection was the immediate cause of the infant's illness. KELLY, Milwaukee.

THE PATHOLOGY OF SPEECH AND VOICE. DOUGLAS GUTHRIE, Edinburgh M. J. **47**:391 (June) 1940.

Too much emphasis is laid on the written word in the schools, while the spoken word is left to chance. In daily life one uses speech far more commonly than writing. About 3 per cent of school children have some speech disorder to disrupt education and cause inefficiency in mature life. In most cases they can be successfully treated or cured by special training. Functional tests of the voice are rarely used but should be a routine.

The writer considers at some length the mechanism of the voice. He describes the development of speech and voice in the young child; the common failure of speech development, and the less common disorders, as well as the problem and treatment of stammering.

The subject is still in its infancy, and its importance is not well appreciated. NEFF, Kansas City, Mo.

TONSILLITIS TREATED WITH BISMUTH. G. MARASCHINI, Med. ital. **21**:65 (Feb.) 1940.

The author reviews the literature on the use of bismuth compounds in the therapy of tonsillitis for the past six years. From the use of bismuth compounds in 44 of his own cases he concludes that bismuth is effective in the treatment of acute tonsillitis. There is a marked improvement in all symptoms in from twelve to twenty-four hours. Treatment is harmless if carefully carried out. A fat-soluble preparation of bismuth is used. The dose is determined according to age, ranging from 1.5 to 3.5 cg. MARTOCCIO, Utica, N. Y.

THE ETIOLOGY OF VINCENT'S ANGINA. A. GALEOTTI FLORI, Riv. di clin. pediat. **38**:297 (May) 1940.

Smears from the membranes in all cases of diphtheritic angina studied showed the presence of spirochetes and fusiform bacilli in numbers proportional to the degree of cellular necrosis. HIGGINS, Boston.

A Case of Congenital Deformity of the Larynx with a Fatal Outcome. J. Ström and L. Troell, Acta pædiat. **25**:266, 1939.

The report describes the case of an 11 month old mongoloid mentally defective infant whose early symptoms of congenital laryngeal stridor became progressively worse, were punctuated by episodes of cyanosis and finally terminated in death. Autopsy revealed a rare anomaly: There was a complete defect of the midportion of the cricoid cartilage, through which an anomalous adhesion between the larynx and the esophagus had been effected. The larynx was unduly soft and mobile. Two similar cases were found in the literature. The embryologic features of the malformation are discussed. In the light of the associated physical anomalies the mental defect was interpreted to be developmental.

McCune, New York.

Psychic Treatment of Stuttering and Phonasthenia. A. Tamm, Acta pædiat. **25**:277, 1939.

The clinical features of stuttering clearly characterize it as a neurotic symptom; in some cases it symbolizes hysteria and in others a compulsion neurosis. Like other compulsions, it is observed oftener in men than in women. The curability of the symptom is not directly proportional to the severity of the speech impediment; "the stutterer who does not stutter"—that is, the one who elaborately avoids pronouncing the troublesome words—is often more difficult to help than the one who tackles the difficulties, no matter how unsuccessfully from the point of view of effective speech. The stutterer's past is apt to be characterized by repressions and his present by ambivalence. Masturbation and autoerotic tendencies are fruitful sources of trouble. Sometimes speech is not involved and only the writing is affected. Certain letters that refer directly or indirectly to subjects that are socially taboo cause more difficulties than neutral letters. The symptom is peculiar to childhood but sometimes does not appear until adult life. Organic insults can accelerate its arrival. A lack of correlation between the development of thought and speech may bring it out. Two types of treatment prevail; the first is simply supervised practice in phonation, and the second seeks by psychiatric or psychoanalytic methods to uncover the cause of the disturbance and to obviate it.

Phonasthenia is defined as incapacitating vocal fatigue without proportionate anatomic cause; it may be due to constitutional disturbances but is often a symptom of neurosis. It is peculiarly apt to overtake persons who use their voices a great deal. It is commoner in women than in men. Its background is like that of stuttering. The treatment is largely psychiatric, although physical modalities are not to be despised.

McCune, New York.

Diseases of the Lungs, Pleura and Mediastinum

Cystic Bronchiectasis. David Reisner and L. G. Tchertkoff, Am. J. Roentgenol. **43**:327 (March) 1940.

The involved portion of lung shows a honeycomb, or spongelike, appearance. The cavities are usually round or ovoid, varying from the size of a pea to that of a walnut. Small fluid levels may be noted. They communicate freely with the bronchi and are lined with a bronchial type of epithelium.

Cystic bronchiectasis is supposed to be caused by arrested development of the bronchial tree. In older persons these cysts may become infected. The diagnosis is confirmed by injections of iodized poppyseed oil. The treatment is symptomatic.

The condition may be compatible with good health. There is danger of recurrent infections. Cystic bronchiectasis has been confused with pulmonary tuberculosis with cavitation, saccular bronchiectasis, emphysematous bullae and other forms of cystic disease of the lungs.

Squire, Chicago.

A Clinical Study of Sulfapyridine in the Pneumonias of Infancy and Childhood with Special Reference to the Influence of This Drug on the Blood Picture. C. C. Fischer and H. A. Agerty, Arch. Pediat. **57**:67 (Feb.) 1940.

Thirteen infants and children with lobar pneumonia and 28 with bronchopneumonia were treated with sulfapyridine. Both forms of the disease responded promptly to therapy. The response of lobar pneumonia was the more dramatic. Toxic symptoms and signs were mild or lacking in all patients treated, and there was no untoward effect on the blood picture.

Orr, Buffalo.

Sulfapyridine in the Treatment of Pneumonia. Samuel Karelitz and R. A. Weinstein, Arch. Pediat. **57**:139 (March) 1940.

The treatment of pneumonia with sulfapyridine was beneficial to 67 of 75 patients. The results in cases of bronchopneumonia were as good as in cases of lobar pneumonia.

Orr, Buffalo.

Subacute Pneumonia in Children. Edith M. Lincoln, Charles Hendee Smith and Thomas W. Kirmse, J. Pediat. **16**:1 (Jan.) 1940.

A subacute form of pneumonia is described. This type of pneumonia is frequently associated with infections of the upper respiratory tract, sometimes nasopharyngitis and often sinusitis. The elevation of temperature is as a rule moderate. Physical examination usually reveals dulness and diminished breath sounds at the base of one or of both lungs, with a few rales. The characteristic roentgen picture is an irregular shadow extending from the region of the hilus, usually along the cardiac border and across the diaphragm, often obliterating the costophrenic angle. The shadow is not homogeneous and often shows bronchial streaking and uneven mottling. There is moderate leukocytosis, with predominance of neutrophils. The sputum is frankly purulent and varies in amount from a few drachms to 8 ounces (240 cc.) or more. The prognosis for life is invariably good, though when this type of pneumonia is associated with a collapsed pulmonary lobe or with severe pleuritis bronchiectasis may result. The disease may persist from two or three weeks to five months. This type of pneumonia has not been classified on a pathologic basis because of recovery in all the typical cases. The infection of the upper respiratory tract must be treated, and postural drainage of the lung should be used, together with bronchoscopic examination in cases of severe involvement or when collapse of a lobe occurs.

Rauh, Cincinnati.

Nonspecific Treatment of Pneumonia in Infants and Children. Francis C. McDonald, New England J. Med. **221**:721 (Nov. 9) 1939.

The author discusses the general medical and nutritional care of infants and children coming from low income groups who were treated for pneumonia in the Boston Floating Hospital (1932 to 1939) prior to the use of specific serum or chemical therapy. Emphasis is laid on the liberal use of oxygen, the use of morphine sulfate as a sedative and the administration of blood transfusions when indicated. The mortality in patients under 2 years dropped from 30 per cent (1932) to 4 per cent (1939), while the number of infants under 2 years of age who received blood transfusions increased from 30 per cent (1932) to 93 per cent (1939).

Gengenbach, Denver.

Empyema in Children. Thomas H. Lanman and Henry L. Heyl, New England J. Med. **221**:1003 (Dec. 28) 1939.

The previous reports of Ladd and Cutler and of Hudson from the Children's Hospital in Boston go through the year 1928. From January 1929 through December 1938 there were 287 additional cases. Statistically the recent series

shows that boys comprised 59 per cent of the patients and girls 41 per cent. The left side was involved in 58 per cent of the cases, the right side in 40 per cent and both sides in 2 per cent.

The pneumococcus was the invading organism in the great majority of cases (80 per cent). Staphylococcus aureus and Streptococcus haemolyticus were each responsible for about 10 per cent of the total number of cases, with the streptococcus causing the highest mortality of the three groups (33 per cent).

The mortality from empyema is exceedingly high among children 2 years of age or under. The mortality in this age group was about the same in the first and the second five year period (1919 to 1924 and 1924 to 1929)—35 and 33 per cent, respectively. There was a decrease to 21 per cent in the third five year period (1929 to 1934) and a gratifying drop to 4 per cent in the last period (1934 to 1939).

There is one form of treatment of empyema which is applicable at least in part to all patients, namely, aspiration. (With proper infiltration of the skin with procaine hydrochloride, aspiration can be accomplished with a minimum of discomfort and without moving the patient from bed.)

The child who has pneumonia and, in addition, fluid in the pleural cavity is now treated as a whole rather than with attention and efforts unwisely focused on the drainage of the fluid.

Intercostal closed drainage is particularly to be advised in cases in which the reaccumulation of fluid after aspiration is so rapid that even daily aspiration fails to give adequate relief. It provides continuous drainage, does away with the discomfort of repeated aspirations and can be accomplished satisfactorily without moving the patient from bed. There is no form of closed drainage that stays absolutely air tight for more than a week or two. The necessity for air-tight drainage for a longer period than two or three weeks is seldom, if ever, sufficiently important to be of any consequence. The value of intercostal closed drainage is particularly great in the early stages and for young patients. Primary open operation, with or without rib resection, should rarely, if ever, he employed for patients under 2 years of age and should never be employed during the synpneumonic stage, regardless of age.

Primary rib resection was used in this series in 168 of 243 cases. These were uncomplicated cases which ended in complete recovery. The average stay in the hospital after drainage had been instituted was twenty-four days, in comparison with forty days for patients receiving intercostal drainage and fifty-seven days for those receiving intercostal drainage followed by rib resection. Good as these results were, they might have been even better had the surgeons adopted their rule of today of doing no primary rib resections in patients under 2 or 3 years of age.

Rib resection is always preceded by a diagnostic tap in order to determine the organism.

The treatment of empyema requires the closest cooperation between the surgeon, the internist and the roentgenologist. GENGENBACH, Denver.

SULFAPYRIDINE IN THE TREATMENT OF PNEUMONIA AND BRONCHOPNEUMONIA IN CHILDREN. A. LICHTENSTEIN, Acta pædiat. **25**:156, 1939.

Fifty children aged from 4 months to 13 years, of whom 37 suffered from lobar pneumonia and 13 from bronchopneumonia, were treated with sulfapyridine. The dose was about 0.1 Gm. per kilogram of body weight daily for from five to twelve days. Without regard to the duration of the disease, defervescence occurred by crisis or lysis and symptoms disappeared within twenty-four to forty-eight hours after the beginning of treatment. All patients recovered except a mongolian idiot who had been sick for nearly two weeks before being treated; death occurred in immediate relation to an operation for suppurative pleurisy. The favorable out-

come was independent of the bacterial flora cultivated from the throat secretions; pneumococci, staphylococci and hemolytic and nonhemolytic streptococci were recovered. There was considerable vomiting.

McCUNE, New York.

CYSTIC DISEASE OF THE LUNGS COMBINED WITH TUBEROUS SCLEROSIS OF THE BRAIN. G. BERG and G. VEJLENS, Acta pædiat. **26**:16, 1939.

Prefaced by brief reviews of the two topics included in the title, a description is given of the case of a 32 year old woman who died of chronic pulmonary disease without cerebral symptoms. Roentgen examination in life revealed an unidentified type of generalized cystic disease of the lungs. Autopsy confirmed this finding and brought to light, in addition, typical tuberous sclerosis of the brain with the familiar accessory tumors of the skin of the face and of the kidneys, together with an intrasplenic splenoma. Pathologic alterations within the hypophysis, the ovaries and the adrenal glands led to the suspicion that an endocrine dyscrasia participated in pathogenesis. A sister of the patient showed adenoma sebaceum and similar pulmonary changes on roentgen examination.

McCUNE, New York.

THREE CASES OF BALL-VALVE BRONCHIAL OBSTRUCTION OF EXTRABRONCHIAL ORIGIN. G. VON SYDOW, Acta pædiat. **26**:465, 1939.

Ball-valve obstructions of definitely extrabronchial origin have been observed in children up to 4 years of age. The patients are nearly always tuberculous children; it is supposed that the wall of the bronchus is indented by the pressure of infected glands. Cases of proved nontuberculous causation have not been reported heretofore. The author describes 2 new cases of the obstruction in children suffering from tuberculosis and an additional case in which the patient was a child who failed repeatedly to react to tuberculin up to a dose of 10 mg. The consequences of peribronchitic process were thought to explain this. In all 3 cases there was a protracted course (from nine to eighteen months); in 2 the subjective features were negligible. The condition is apt to escape recognition by routine diagnostic methods.

McCUNE, New York.

Diseases of the Gastrointestinal Tract, Liver and Peritoneum

GASTRIC PERISTALSIS AFTER PYLOROTOMY IN INFANTS. HAROLD K. FABER and JOSEPH H. DAVIS, J. A. M. A. **114**:847 (March 9) 1940.

The customary feeding procedure after the Rammsted operation for pyloric stenosis has been to give small amounts of water or of formula and water beginning two to six hours after the operation. By giving barium sulfate postoperatively to 10 babies the authors were able to study gastric peristalsis, and they discovered that there is a marked depression of gastric emptying, lasting from twenty-four hours to three days. This situation is similar to that following other abdominal operations and frequently leads to vomiting. The urgent need for fluid observed in former years is not as often present with earlier diagnosis and parenteral administration. Since the average onset of gastric peristalsis occurs about twelve hours after operation, it is suggested to defer feeding for a day or to give water sparingly at first.

HEERSMA, Kalamazoo, Mich.

CONGENITAL PYLORIC STENOSIS WITHOUT VOMITING. G. BEXELIUS, Acta pædiat. **25**:22, 1939.

Deductive inference and observations in cases in which medical measures were used lead one to expect to encounter examples of congenital pyloric stenosis in which compensatory forces render the obstruction virtually asymptomatic. This anticipation has been realized in 3 cases, those of Meuwissen and Slooff, of

Wallgren and of Malmberg. Bexelius reports on the case of a 4½ month old boy who exhibited visible gastric peristaltic waves, roentgen narrowing of the pyloric canal and considerable retention of opaque medium in the stomach at the end of six hours. The infant never vomited. Treatment was not required. The case is interpreted to depreciate the importance of roentgen findings in formulating the decision to operate in cases of pyloric stenosis. The significance of the case is diminished and the force of the argument weakened by the author's failure to make any mention of the cardinal diagnostic feature of pyloric stenosis, namely, a palpable tumor.

McCUNE, New York.

TREATMENT OF INTUSSUSCEPTION IN CHILDREN. J. HINDMARSH and S. ÅBERG, Acta pædiat. **25**:139, 1939.

At the time of its introduction by Ohlsson and Pallin in 1927, the bloodless reposition of intussusception in children was an advance over routine surgical operation. With improvement of anesthetics and surgical technic the objections to the method are regaining importance. From 1930 to 1934 the Crown Princess Louisa's Children's Hospital tried vigorously to accomplish reduction with pressure enemas of radiopaque material and manual manipulation without anesthesia for two to three hours before resorting to laparotomy; the results were not particularly good. Since that time only twenty to thirty minutes of such treatment is permitted before operation; light anesthesia is used, and not more than 1 meter of pressure is allowed. The results of this more elastic policy have been excellent.

Between 1930 and April 1939, 66 patients were treated; 53 were boys and 13 girls. The youngest was 3 weeks and the oldest 12 years of age. In 39 the condition was hyperacute, in 20 acute and in 7 subacute; in none was it chronic. In 51 it was of the simple ileocecal type; in 10, ileocolic, in 3, double, and in 2, involving the small intestine, arising from Meckel's diverticulum. Vomiting was a symptom in 63 cases; abdominal pain, in 58; issue of blood from the rectum, in 48, and a palpable abdominal tumor in 28. In only 16 cases was the classic syndrome manifest in its entirety. The diagnosis was made earliest when rectal bleeding occurred; in two thirds of these cases the patients were in the hospital within six hours.

Twenty-four patients were treated by militant conservatism and 42 according to the elastic policy. In the first group 18 required operation despite vigorous manipulation; 4 died. In the second group 30 patients required operation but only 1 died. Credit for the better results is given both to the partial reduction accomplished by the enema, which makes a small incision possible, and to improvement of anesthesia. Conceding that the controversy between the bloodless and the surgical method has not been settled, the author recommends the combined approach.

McCUNE, New York.

SO-CALLED INTERPOSITION OF THE COLON. K. G. KAIJSER, Acta pædiat. **25**:149, 1939.

Interposition of the colon signifies the lapse of the large bowel between the diaphragm and the upper surface of the liver. The anomaly is apparently an acquired one, as is attested by the fact that it has been reported as occurring principally in adults, notably in persons who have recently lost much weight, who have suffered from local peritonitis due to gastric ulcer or, finally, who have had phrenicoexeresis performed to immobilize the diaphragm. The possibility that congenital anatomic irregularities may act as predisposing factors is suggested by a few cases in which the patients were children and also by the fact that the interposed colon is usually described as redundant and the mesentery unusually long. The symptom is abdominal pain. This is apt to be periodic, corresponding to the fact that the colon may return spontaneously to its normal anatomic relations for long periods. The case reported concerns a 3 year old exuberantly healthy boy. Interposition of the colon between the liver and the right side of

the diaphragm was discovered in the course of a routine physical survey. When a barium sulfate enema was administered, three days later, the anomaly had disappeared. The hepatic flexure was demonstrated to be rather long and winding.

McCune, New York.

Dextrose in the Treatment of Diarrhea in Children. N. Malmberg, Acta pædiat. **25**:181, 1939.

Malmberg reviews the theoretic reasons for the oral administration of dextrose to infants who are undergoing starvation or restriction of food in treatment of diarrhea. On the basis of satisfactory results in his own clinic its use is recommended. Detailed directions for the handling of diarrhea in children are given.

McCune, New York.

Gallstones in Children. H. Nathhorst, Acta pædiat. **26**:319, 1939.

Although cholelithiasis is not commonly diagnosed clinically in children, its identification at autopsy and the fact that about 400 cases have been reported of its occurrence in children indicate that gallstones are more common in young subjects than is ordinarily realized. Two cases are reported. In 1 the diagnosis was made roentgenographically, through the recognition of an opaque stone, and was confirmed at operation. In the second a radiopaque dye was required to complete the diagnosis. The patient was treated medically. The recognition and treatment of cholelithiasis are discussed. The principles are those that apply to adults.

McCune, New York.

Meckel's Diverticulum as the Cause of Disease in Children. A. Roosvall, Acta pædiat. **26**:372, 1939.

The first case of the anomaly now known as Meckel's diverticulum is said to have been described by Lavater in 1671. Meckel's work appeared in 1812. The frequency of Meckel's diverticulum is said to vary between 1 and 3 per cent in various series of autopsies. Balfour found 15 cases in a series of 10,600 laparotomies at the Mayo Clinic. Between 1917 and 1936, 31,034 children under 16 years of age were treated in the surgical department of the Göteborg Children's Hospital. Two thousand, three hundred and fifty-four laparotomies were performed; in 15 cases Meckel's diverticulum was found. The length of the diverticulum is usually between 5 and 6 cm., but it can vary from 1 to 85 cm. It is usually encountered about 50 cm. above the ileocecal junction; however, its position with reference to this point may vary between 15 and 90 cm. The appendage is much more common in boys than in girls; in Christie's series, 75 per cent of the patients were boys. In the 15 cases in the Göteborg series, 10 of the patients were boys. Some authors have commented on the frequency of associated defects of development, including mental retardation. An intact Meckel diverticulum is a harmless anatomic peculiarity; however, it is not infrequently the site of disease. The most common of the disturbances to which it is subject are ulceration with perforation or hemorrhage, acute or chronic infection, strangulation, intussusception and volvulus. These complications are discussed and exemplified by material derived from the archives of the Children's Hospital.

McCune, New York.

Roentgen and Anatomic Appearance of Congenital Pyloric Stenosis During and After the Manifest Stage of the Disease. G. Runström, Acta pædiat. **26**:383, 1939.

This paper, the length and completeness of which entitle it to be termed a monograph, deals with the roentgen features of congenital hypertrophic stenosis of the pylorus during the manifest stage of the disease and after the disappearance

of symptoms. The descriptions are drawn from observation of 107 patients, of whom 85 were examined during the first few weeks of life and 22 after the obstructive phase of the illness had passed. All patients were treated by medical measures; 1 died of pyloric stenosis and 2 of other causes.

The roentgen features were found to be characteristic. In the manifest stage of the disease the pyloric canal is contracted to a narrow lumen 2 to 3 cm. in length. The stomach shows the type of peristalsis associated with obstruction; the peristaltic movements do not pass beyond the proximal end of the constriction. The duodenal cap is not affected. The opening time of the stomach is prolonged to two hours. After the termination of manifest symptoms in children up to 4 years of age the lumen of the pylorus is somewhat more ample and the gastric emptying time is normal. Little additional change occurs up to 14 years of age except that in some cases small peristaltic waves make their appearance along the pyloric canal. The anatomic changes consist of thickening of both the muscular coat and the mucosal lining of the pylorus.

The description is copiously illustrated and the discussion generously documented.

McCune, New York.

Intractable Vomiting in Young Infants. C. E. Räihä and A. Ylppö, Acta pædiat. **26**:434, 1939.

Despite ardent defense of both points of view, it remains uncertain whether pyloric stenosis is a congenital or an acquired lesion. None of the evidence that has been presented up to the present time leads with inescapable logic to one conclusion and not the other. Certain observations that have been made in the authors' clinic point to its acquired character. The incidence shows a well defined seasonal distribution that is not closely correlated with the seasonal variation in the number of live births in Finland; the disease is much more common in the spring, whereas the peak in the birth rate of live children is reached in July. This shows good agreement with the data of Ramstedt and of Bayer. Unsuccessful attempts have been made to relate the seasonal variation to rachitic spasmophilia and to other types of vitamin deficiency. Little attention has been paid to the complicity of infectional factors, which notoriously operate to a striking degree in the spring. As has been previously shown by Ylppö, these infections not infrequently produce gastritis. It is a defensible hypothesis that infectional gastritis acts as a precipitating cause in activating a latent tendency to pylorospasm and pyloric stenosis. Seven cases are reported in support of this theory.

McCune, New York.

Nervous Diseases

Atrophy of the Thalamus in a Case of Acquired Hemiplegia Associated with Diffuse Porencephaly and Sclerosis of the Left Cerebral Hemisphere. W. E. LeGros Clark and D. S. Russell, J. Neurol. & Psychiat. **3**:123 (April) 1940.

A girl aged 13 had an acute illness characterized by initial symptoms of vomiting, convulsions on the right side, unconsciousness and fever, followed by complete right hemiplegia, which was at first flaccid and later spastic. The spinal fluid showed moderate pleocytosis, in which lymphocytes predominated. After a brief and partial remission, during which the residuals of the hemiplegia persisted, there was a relapse, with attacks of coma and convulsions on the right side terminating in status epilepticus; death occurred about five years after the onset of the illness. Pathologically, there were atrophy and porencephaly of almost the entire left cerebral cortex, accompanied by advanced demyelination and gliosis of the white matter of that hemisphere. The distribution of the atrophy corresponded to the vascular territory supplied by the left middle cerebral artery and extended

only to a limited degree into the territories of supply of the anterior and the posterior cerebral artery, largely sparing the cingulate gyrus, the visual striate area, the hippocampal region and a small part of the central gyri. There were also descending degeneration of the pyramidal tract and mild atrophy of the contralateral cerebellar hemisphere, but no involvement of the corpus striatum and the globus pallidus. The most striking feature was the atrophy of the left optic thalamus, consisting of almost complete degeneration of its anterior, ventral, lateral and medial nuclei, and of the pulvinar, the medial geniculate body and the reticular nucleus. The changes suggested that the parts of the thalamus involved are concerned with the projection of impulses to definite parts of the cerebral cortex, an assumption which is largely corroborated by studies of experimental decortication. Thus, the few persistent cells in the anterior and the ventral nucleus of the thalamus were probably related to the intact parts of the cingulate and the central gyrus, respectively. The only parts of the thalamus entirely spared were the lateral geniculate body, the central median nucleus and a narrow subependymal zone of small cells. The sparing of the lateral geniculate body is probably related to the intactness of the area striata. The central median nucleus and the subependymal zone are apparently the only parts of the thalamus which do not project on to the cortex. The connections of the central median nucleus are still obscure, and the beliefs that it may have connections with the insular cortex, the corpus striatum or the pallidum are not borne out by the observations in this case. The authors suggest that this nucleus may represent intralaminar nuclear elements present in the thalamus of lower mammals. The existence of thalamostriatal connections is doubtful. The atrophy of the thalamus in this case may be attributed to interruption by the cortical destruction of the axonal processes, rather than to transneuronal atrophy due to interruption of descending corticothalamic fibers or to direct vascular disturbance. The etiologic factor in the acquired hemiplegia in this case remains undetermined but, as in similar cases in the literature, may be some type of encephalitis.

MALAMUD, Ann Arbor, Mich. [ARCH. NEUROL. & PSYCHIAT.]

THE CENTRAL NERVOUS SYSTEM IN CONGENITAL ABSENCE OF ONE LEG. E. W. WALLS, Lancet **1**:123 (Jan. 20) 1940.

Knowledge of the neuropathologic changes occurring in the neuraxis as a result of congenital abnormalities of the extremities or of amputation is incomplete. In disagreement with Taft, who stated that no change in the spinal cord occurs after amputation, Walls presents data which support the stand of Campbell, namely, that "in long-standing cases the predominant change is a homolateral atrophy, represented by a general reduction in volume of white and grey matter alike, and involving those particular segments of the cord which receive and give off the sensory and motor nerves which originally supplied the skin and muscles of the amputated member." The posterolateral cells are more liable to atrophy.

Walls studied the brain and spinal cord of a woman aged 75, who died of pneumonia. Her congenital deformities consisted of absence of the left leg below the knee and complete absence of both hands, only rudimentary thumbs being recognizable. The greatest asymmetry was observed in the sacral segment of the cord, the left side being smaller than the right in all components. The tractus gracilis higher in the cord was small. The brain stem and the right side of the cortex were normal.

Three theories concerning the pathogenesis of congenital abnormalities are suggested: (1) There may be either faulty development of certain cells in the nervous system or, possibly, hypertrophy of a group of cells; (2) amniotic bands may amputate normally developing limbs, and (3) the primary anlage may have a "faulty quality."

KRINSKY, New London, Conn. [ARCH. NEUROL. & PSYCHIAT.]

CLINICAL PROBLEM OF MIGRAINE IN CHILDREN. A. OLIVEIRA LIMA, Brasil-med. **53**:765 (July 29) 1939.

According to Oliveira Lima, allergy is the main etiologic factor producing migraine in children. Of secondary importance are heredity and constitutional physical factors, or pathologic factors. The condition is more frequent in girls than in boys and is more frequent in nervous than in normal girls. The clinical symptoms are those of the prodromal and aural periods, the attack and the after-attack period. The topographic pattern, acuteness and evolution of the disease vary in the different cases. The main symptom of the attack is the unilateral headache, which appears at regular or irregular intervals with pain of oppressive, irradiating or neuralgic type and is accompanied by nausea, vomiting and various sensory disturbances. Intolerance to light is more or less acute in all cases. The after-attack stage gradually establishes itself, after aggravation of the acute symptoms of the attack. It becomes evident by appearance of physical depression, sleep, disturbances in the secretion and elimination of urine, rhinorrhea and general dull pain. In some cases the development of an abortive or equivalent attack prevents occurrence of typical attacks. Chronic headache may be a late sequel of the disease. Treatments are of three types: (1) preventive, (2) symptomatic and (3) after-attack. There are two forms of preventive treatment: that in which patients are advised not to marry persons who are sensitive to the same allergens, and the actual preventive treatment of the patient, which includes proper diet and avoidance of food and ambient allergens to which the patient is sensitive. Symptomatic treatment varies with the type of headache. The following general measures are indicated: The patient is confined to a dark, quiet room, and drugs with a vasodilating action are administered during the prodromal and aural stages; during the attack, according to indications, drugs of vasoconstrictive action, or else analgesics, sedative drugs and especially ergotamine tartrate, are given. Caffeine, calcium and some other drugs can be resorted to when indicated. The after-attack treatment is a continuation of the symptomatic treatment with certain modifications. It consists of the proper diet, rest and administration of either sedatives or stimulants, according to indications.

J. A. M. A.

THE FAMILIAL INFANTILE FORM OF DIFFUSE SCLEROSIS OF THE BRAIN (KRABBE). CORNELIA DE LANGE, Ann. pædiat. **155**:277 (July-Aug.) 1940.

Four children of one family were taken ill in succession with the same cerebral syndrome. Two children died at the time of the author's first communication on the subject. Of 1 of them a histologic examination was made, which led to the diagnosis of familial infantile sclerosis of the brain. Subsequently the 2 other children died, and an investigation of the brain was carried out on 1 of them, giving the same results as were observed in the former case, with only slight local and quantitative differences. This examination confirmed the author in her opinion that the illness lies in an endogenous disease of the glia which, after the modern conception of familial diseases of the nervous system, is part of a general metabolic disorder and does not represent a constitutional weakness of the nervous system.

EDITOR'S SUMMARY.

POSTURAL NYSTAGMUS AND HEAD INJURY. F. BERLIN and C. O. NYLÉN, Acta pædiat. **25**:19, 1939.

An 8 year old girl was unconscious for three days after a bicycle accident, then gradually recovered and was discharged from the hospital free from symptoms on the fifth day. The prompt reappearance of vomiting combined with vertigo and diplopia led to her return to the hospital. It was then recognized that, although the ocular signs were normal in most postures, spontaneous nystagmus made its appearance when the child lay on her left side or when she was

made to bend over and allow her head to hang. The other findings were unimportant. The spinal fluid contained a few erythrocytes. Repeated roentgen examination revealed a fine linear fracture in the basilar part of the occipital bone. The nystagmus abated slowly; it had virtually disappeared after about a month. Emphasis is placed on the value of this symptom in calling attention to lesions in and around the vestibular nuclei.

McCUNE, New York.

ENCEPHALOGRAPHY IN CHILDREN. Å. PALMGREN, Acta pædiat. **25**:227, 1939.

This is a routine review of the results of 74 pneumoencephalograms taken of 68 children aged 13 days to 14 years. The air was introduced by puncture of the cisterna magna instead of the lumbar subarachnoid space; the cisternal approach is characterized as simpler, less apt to produce undesirable side effects and requiring a smaller amount of air than the lumbar route. The details of narcosis are described; complications and sequelae are enumerated. There were no deaths, but headache and vomiting followed at varying intervals in about half the cases. One patient suffered a severe psychic upheaval. Divers lesions were visualized satisfactorily.

McCUNE, New York.

THE NEED OF SPECIAL HOSPITALS FOR EPILEPTIC CHILDREN. A. PETREN, Acta pædiat. **25**:241, 1939.

Encouraged by the gratifying results in the treatment of epilepsy obtained by the Danish special hospitals for epileptic children, Swedish public health authorities are campaigning for similar facilities. Their efforts have been partly but not entirely successful. The story is told in some detail.

McCUNE, New York.

A CASE OF INTRATHORACIC SYMPATHETICOBLASTOMA IN AN INFANT. F. WAHLGREN and S. RUDBERG, Acta pædiat. **25**:292, 1939.

A previously healthy 11 month old girl died of an acute paralytic illness thought to be poliomyelitis. Autopsy revealed a spheroid tumor about 5 cm. in diameter, located paravertebrally in the right thoracic cavity, at the level between the second and the fourth ribs. The mass was found to communicate by a thin pedicle that passed through the intervertebral space with an elongated tumor that lay extradurally within the spinal canal. Although at one place a few tendrils invaded the neighboring tissues, the neoplasm was well encapsulated. The soft consistency and the gray color of the cut surface suggested a sympathetic neurinoma, an inference that was confirmed histologically; the microscopic features resembled those of a sympatheticoblastoma, according to the classification of Scott and Palmer. The literature contains 10 cases in which both intrathoracic and intraspinal components were present.

McCUNE, New York.

ENCEPHALOGRAPHIC EXAMINATIONS IN ORGANIC NERVOUS DISEASES IN CHILDREN. O. BRANDBERG, Acta pædiat. **26**:90, 1939.

Brandberg describes 3 cases that illustrate the clinical usefulness of spinal pneumoencephalography.

McCUNE, New York.

TREATMENT OF CHOREA MINOR, WITH A SPECIAL VIEW TO EMPLOYMENT OF LARGE DOSES OF SODIUM PHENOBARBITAL. P. DRUCKER, Acta pædiat. **26**:98, 1939.

Forty-one children, 13 boys and 28 girls, aged 6 to 14 years, were treated for chorea with phenobarbital. Comparatively large initial doses, up to 0.3 Gm., were given for fourteen days or until an eruption appeared; thereafter, smaller doses of between 0.1 and 0.15 Gm. daily were given for varying periods. In more than half of the cases clinical recovery occurred within two weeks, and in three quarters

of the cases it occurred within three weeks. Ill effects were seen in only 2 cases; in 1 the child exhibited transient hematuria, and in the other there was brief febrile angina. The treatment is characterized as safe and highly effective, but the warning is issued that it should be reserved for hospitals. A hypothetic explanation of the therapeutic mechanism is offered. McCUNE, New York.

Psychology and Psychiatry

GROWTH DISORDER OF THE SKULL IN MONGOLISM. C. E. BENDA, Am. J. Path. **16**:71, 1940.

A histologic study of the synchondrosis spheno-occipitalis, of the synchondrosis sphenoethmoidalis and of tissue from the vertebrae in mongolism is presented. It is shown that proliferation of the cartilage is absent or insufficient. The histologic differences between mongolism, chondrodysplasia and cretinism are demonstrated and discussed. The growth disorder in mongolism is not restricted to the cartilaginous epiphysial lines but involves also the membranous bones. An analysis of the observations indicates that the development of the growth disorder known as mongoloid deficiency appears to be dependent on a congenital absence or deficiency of those agents from hypophysial or extrahypophysial sources which stimulate differentiation and growth. FROM AUTHOR'S SUMMARY. [ARCH. PATH.]

DEFECTIVE CHILDREN. A. R. RONALD, Indian J. Pediat. **7**:70 (April) 1940.

This paper is a plea for coordination of medical and pedagogic efforts on behalf of defective children in order that the fullest benefits may be obtained.

TENNEY, Madison, Wis.

INCIDENCE OF PSYCHOSES AMONG CHILDREN BOTH OF WHOSE PARENTS HAD AFFECTIVE PSYCHOSES. BRUNO SCHULZ, Ztschr. f. d. ges. Neurol. u. Psychiat. **169**:311 (April) 1940.

Schulz studied 55 married couples both of whom had some type of affective psychosis. Only couples were chosen who had at least one child 20 years of age or more. There were 213 children, with 1 pair of twins. The social level of the parents was definitely higher than that of another series in which both parents were schizophrenic or in which only one of the parents had an affective psychosis. The incidence of psychoses among the children was lowest in the group in which at least one of the parents had an affective psychosis in some way related to age (involutional melancholia)—7 per cent with manic-depressive psychosis and 4 per cent with schizophrenia. Among the children of parents one of whom at least showed schizophrenic features the incidence of psychoses was definitely higher—30 per cent with manic-depressive psychosis and 7 per cent with schizophrenia. The highest incidence was in the children of parents both of whom had affective psychoses—37 per cent were manic-depressive and 13 per cent schizophrenic. The incidence of psychoses, exclusive of those related to age, was 28 per cent for manic-depressive psychosis and 12 per cent for schizophrenia. Twenty-one of the 55 couples had no psychotic children.

The incidence of psychoses in the children of parents both of whom had affective psychoses is definitely higher than that encountered in the children of parents only one of whom had an affective psychosis. These facts reemphasize the probable role of genetic factors in the pathogenesis of these mental diseases. The relatively large number of schizophrenic children of manic-depressive parents is noteworthy. Manic-depressive children of schizophrenic parents, on the other hand, are rare. SAVITSKY, New York. [ARCH. NEUROL. & PSYCHIAT.]

Diseases of the Genitourinary Tract

THE NEUTRALIZATION TEST IN LYMPHOGRANULOMA VENEREUM. E. RODANICHE, J. Infect. Dis. **66**:144 (March-April) 1940.

By combining virus with convalescent serums, the authors showed neutralizing antibodies to be present in 8 of 9 patients with positive Frei reactions and absent in the serums of 36 persons with negative Frei reactions. TOOMEY, Cleveland.

NEURAL MATURATION AS EXEMPLIFIED IN ACHIEVEMENT OF BLADDER CONTROL. MYRTLE B. MCGRAW, J. Pediat. **16**:580 (May) 1940.

Two sets of identical twin boys were under intensive study during seventeen and twenty-eight months, respectively, to determine the sequential changes in behavior which accompany and denote the development of voluntary control of micturition and to ascertain the effect of an early systematic training schedule on the ultimate achievement of control of the bladder. One member of each pair of twins, after the first month of life, was placed on the chamber at hourly intervals during seven hours of the day. Their twins were not allowed on the chamber until they were 14 and 24 months of age respectively, at which time they were exposed to the same schedule of toilet training. In both cases the achievement of these boys approximated that of their brothers even at the onset of their training schedule. The achievement records of the 2 children who were given systematic "training" indicate that there are several distinct phases in the attainment of control of the bladder and that these phases are not altered by the imposition of a training program. During the early months the reflex is so hypersensitive that any mild handling may initiate voiding. Subsequently the reflex becomes less sensitive and there is a decline in the percentage of successful responses to the toilet situation. The onset of cortical participation is indicated by a sharp rise in the achievement curve and is reflected in the child's behavior by unmistakable signs of awareness of the act and the result. A regressive phase follows, which coincides with a period of rapid advancement in complex mental processes involving not only simple associations but discrimination and generalization. As these processes advance to a stage of functional integration with other activities, there occurs a second rapid rise in the achievement of control of the bladder.

RAUH, Cincinnati.

FEMALE GENITAL HYPOPLASIA. SAMUEL R. MEAKER, J. Obst. & Gynaec. Brit. Emp. **47**:40 (Feb.) 1940.

The author believes that female genital hypoplasia is frequently due to modification of endocrine function by excessive emotional or physical stress, by anemia or by chronic infections during adolescence. Any abnormality in the establishment of the menarche warrants a thorough investigation of the physical and emotional status of the patient, with institution of corrective measures as prophylaxis against inadequate ovarian and uterine development.

ADAIR and POTTER, Chicago.

GRANULOSA-CELL TUMOUR WITH PRECOCIOUS SEXUAL DEVELOPMENT IN A CHILD AGED SIX. FRANK STABLER and J. GREIG THOMASON, J. Obst. & Gynaec. Brit. Emp. **47**:199 (April) 1940.

A granulosa cell tumor in a girl aged 6 years produced precocious development of the breasts and the external genitalia, growth of axillary and pubic hair and hyperplasia of the endometrium with bleeding. After operation retrogression to the normal state of a 6 year old child occurred. The estrogen in the blood and in the urine returned to normal levels. ADAIR and POTTER, Chicago.

TRICHOMONAS VAGINALIS VAGINITIS AND MONILIAL VAGINITIS: THEIR DIAGNOSIS AND TREATMENT. R. F. MATTERS, M. J. Australia **1**:693 (May 18) 1940.

In the treatment of these diseases the author has obtained the best results with the use of silver picrate powder.

GONCE, Madison.

PRACTICAL POINTS IN THE DIAGNOSIS AND TREATMENT OF RENAL TUMOURS. TERENCE MILLIN, Practitioner **145**:25 (July) 1940.

In many cases (40 to 60 per cent) Wilms's tumor is inoperable when first seen. Of patients in whom extirpation of the tumor is carried out, 30 per cent die as a result of the operation; only 20 per cent survive one year, and 5 per cent survive three years.

Obviously, the successes of surgical treatment alone have been outstandingly few. On the other hand, no case is on record of the cure of such a tumor by irradiation alone. Roentgen therapy will cause a remarkable shrinkage of a very large proportion of these tumors, amounting in some cases to a 50 per cent reduction in size. The larger the proportion of embryonic sarcomatous cells which are highly radiosensitive, the greater will be the shrinkage; the epithelial cells appear to be more radioresistant. A nephrectomy (preferably transperitoneal) for removal of the shrunken tumor three to six weeks after adequate irradiation will be much easier and cause less shock to the small patient, giving a lower operative mortality. Blood transfusions should be given before and after the operation if indicated. It is understood, of course, that the presence of metastases, cachexia or a fixed growth rules out operative intervention, and indeed roentgen therapy can offer nothing but prolongation of life by some months. It appears unwarrantable, therefore, to carry out any such treatment. One or more courses of postoperative irradiation should be instituted on the assumption that some malignant cells may have been "split" or left behind at operation. This combination of irradiation and surgical extirpation appears to be based on sound principles, and the results to date suggest that it holds out hope of a larger proportion of cures.

GELSTON, San Francisco.

ENURESIS IN CHILDREN. C. T. POTTER, Practitioner **145**:33 (July) 1940.

Although without available statistics the effect of the present emergency on the incidence of enuresis in children cannot be judged, it has served to emphasize the social ostracism suffered by children afflicted with this condition. Among the many difficulties of evacuation, the problem of placing an enuretic child in a new home has been a serious one. He is seldom welcome anywhere. It may be that some of these sufferers who were fortunate enough to have been accepted have become "dry" because of their new environment, but it is more usual to hear of instances in which hosts have refused them on hearing of their complaint or have sent them home on discovering that they have wet the bed. Their unpopularity is shown by the attitude of the government authority, which includes enuresis on the cards for the evacuation scheme among such conditions as scabies, pediculosis and impetigo, which are of such a nature as to preclude children afflicted with them from participating in the privileges open to others. In the case of the enuretic children, billeting officers and social workers in the reception areas have had great difficulty in finding sympathetic homes for them.

Although every one dealing with large numbers of such patients must admit that many resist all forms of treatment, the great majority can be helped if sufficient trouble is taken. So great is their social disability, to say nothing of their own discomfiture, that they surely deserve the most sympathetic endeavor to assist them in getting over their affliction.

GELSTON, San Francisco.

SYNDROME OF ACUTE PRIMARY ORCHITIS IN CHILDREN. G. LIVATHINOPOULO, Arch. de méd. d. enf. **43**:142 (May-June) 1940.

Since Ombrédanne introduced the routine operative procedure for acute orchitis accompanied with torsion of the testicle, this method of intervention has been generally followed.

Of 18 children admitted to the Hospital for Sick Children in Paris, France, during the years 1934 and 1935 with symptoms of torsion, 7 showed the genuine picture of this disease; 8 others showed torsion of the hydatid of Morgagni, and the remainder exhibited unusual accidents, such as hemorrhagic pachyvaginitis, cyst of the strangulated cord and intratesticular abscess. All of these were admitted for emergency handling. The clinical histories are included in the text.

AMESSE, Denver.

Diseases of the Ductless Glands; Endocrinology

LIVER GROWTH IN RATS TREATED WITH ANTERIOR PITUITARY GROWTH HORMONE. MILTON LEE and WILLIAM FREEMAN, Endocrinology **26**:493 (March) 1940.

Summarizing their experiment, Lee and Freeman state:

"Estimations were made of the number of hepatic cells in the livers of 23 normal control rats, 23 litter mates treated with anterior pituitary growth extract for 1 to 16 days and kept on a paired-feeding regimen, and 8 litter mates treated with growth hormone but allowed food ad libitum.

"The average liver weight, the ratio of liver weight to body weight and the total number of hepatic cells were significantly greater in the treated animals than in the controls. The number of hepatic cells per gram of fresh liver was essentially the same in the two groups. . . .

"It is concluded that under the influence of the growth hormone the liver responds with a true hyperplasia, with all of the structural components participating equally."

JACOBSEN, Buffalo.

QUANTITATIVE STUDIES ON THE HORMONES OF HUMAN PITUITARIES. EMIL WITSCHI and GARDNER M. RILEY, Endocrinology **26**:565 (April) 1940.

Assays of human hypophyses showed no distinct variations according to age and sex with respect to thyrotropic, lactogenic and chromatophorotropic hormones. Gonadotropic hormone was present only in small quantities in children, was four times more potent in men than in women during reproductive age and was highest in old women and in persons who had been castrated.

JACOBSEN, Buffalo.

ANTIBODY RESPONSE IN RABBITS TO EXTRACTS OF HUMAN PREGNANCY URINE AND TO EXTRACTS OF NORMAL FEMALE URINE. KATHARINE M. HOWELL and SAMUEL SOSKIN, Endocrinology **26**:577 (April) 1940.

It is concluded that the complement-fixing antibodies and precipitins produced are not specific antihormones.

JACOBSEN, Buffalo.

A GREAT CRAVING FOR SALT BY A CHILD WITH CORTICO-ADRENAL INSUFFICIENCY. LAWSON WILKINS and CURT P. RICHTER, J. A. M. A. **114**:866 (March 9) 1940.

Investigation of the past dietary history of a 3½ year old boy who showed precocious sexual development and peculiar actions was made after his death. Postmortem examination revealed adrenal hypertropy with atrophy of the cortex. The history revealed an extreme craving for salt from his first discovery of it at 1 year of age; this was associated with extremely difficult feeding habits. Similar cravings have been noted in adrenalectomized rats.

HEERSMA, Kalamazoo, Mich.

DIABETES MELLITUS IN CHILHOOD, WITH SPECIAL REFERENCE TO ITS PROGNOSIS. P. SELANDER, Ann. pædiat. **154**:317 (March) 1940.

The author has made inquiries into the fate of the child patients discharged with insulin medication from one of the hospitals in Göteborg. The results were as follows:

1. The author was able to obtain reports from 155 out of 156 children treated with insulin, 27 of whom (17.4 per cent) had died.

2. The morbidity during the five year period from 1935 to 1939 did not show a decline in comparison with the preceding five year period. The cause was found in an increased mortality among the group over 16 years of age, which was more numerously represented in the last five year period.

3. The duration of the diabetes among those who died during the period 1925 to 1929 was two and two-tenths years on an average, during the period 1930 to 1934 on an average four and five-tenths years and during the period 1935 to 1939 on an average seven and four-tenths years.

4. Coma as a cause of death has decreased during each five year period. Tuberculosis has taken the lead during the last period as the most frequent cause of death.

5. In no case of certain diabetes could a complete cure be observed. The whole material concerning diabetic children is further discussed with regard to age, sex, seasonal fluctuation and heredity. In addition, the author reports a case of diabetes in an infant aged 10 months.

FROM THE AUTHOR'S SUMMARY.

A CASE OF BASEDOW'S DISEASE IN A TEN YEAR OLD GIRL. G. EDGREN, Acta pædiat. **25**:41, 1939.

The illness commenced with unilateral exophthalmos and equivocal evidence of hyperthyroidism. After the development of a positive tuberculin reaction the symptoms became more characteristic, with protrusion of both eyes, elevation of the basal metabolic rate to + 48 per cent and the appearance of a struma. Roentgen treatment was followed by a period during which the disease progressed and then by slow improvement. The possibility of spontaneous regression could not be excluded.

McCUNE, New York.

DIABETES AND DIET. J. MÖLLERSTRÖM, Acta pædiat. **25**:206, 1939.

In a temperate yet cogent argument Möllerström expounds his concepts concerning the selection of food for the diabetic patient. His experience, he says, includes more than 1,000 cases. Illustrating the extremes to which nonphysiologic thinking has led some authorities, he cites Lundberg's advocacy of large quantities of vegetables (up to 5 Kg. a day) and alcohol (up to 200 cc. of cognac daily) for the treatment of acidosis in adult patients. Attention is drawn to the divers deficiency syndromes engendered by the fantastically one-sided diets that have enjoyed popularity—among physicians if not among patients—in the past. Credit is given to the pediatrician for the introduction of more physiologic diets, and particular tribute is paid to Stolte, who first defended the use of a normal mixed fare for diabetic children. The need for an ample amount of carbohydrate is stressed. However, since it appears that ketosis can ensue from the incomplete conversion of carbohydrate to fat as well as from defective β-oxidation of fat, excess of carbohydrate may be harmful. Although it is to be regarded as axiomatic that hyperalimentation is harmful, starvation, too, is fraught with grave dangers. Ketosis represents the principal hazard. The metabolic consequences of hyperglycemia and glycosuria without acidosis are problematic. Although it is usually assumed that the atherosclerosis which so frequently accompanies diabetes in elderly persons is a consequence of the diabetes, it is equally likely on a priori grounds that the mildly diabetic state represents a defense mechanism to

supply more dextrose to the undernourished myocardium. This somewhat novel concept is supported by clinical evidence. Its corollary is that zealous treatment of the diabetic symptoms in such cases may exaggerate the myocardial inadequacy. In general, the effect of a given amount of insulin is significantly enhanced when its administration is skilfully timed in relation to the patient's endogenous rhythm. This rhythm is more clearly discernible by studies of the diurnal fluctuation of acid formation than by studies of the blood and urinary sugar. The patient's own appetite is one index of his requirements; this valuable evidence should not be jettisoned by prescribing a rigid, unvarying fare. There is no substantial difference between the diet that is suited to the juvenile diabetic patient and that which is indicated for the adult.

McCUNE, New York.

THE GRAVITY OF DIABETES AT PUBERTY. S. NORDWALL, Acta pædiat. **26**:334, 1939.

As diabetes is no longer a necessarily fatal disease in children, it is now possible to procure statistics that indicate a practically uniform augmentation of severity of the disease with the approach of puberty. The increase of severity is indicated by a consistent enlargement of the average daily requirement of insulin.

McCUNE, New York.

Diseases of Muscles, Bones, Joints and Lymph Glands

THE USE OF VITAMIN B_6 IN PSEUDOHYPERTROPHIC MUSCULAR DYSTROPHY. WILLIAM ANTOPOL and CLEMENT E. SCHOTLAND, J. A. M. A. **114**:1058 (March 23) 1940.

Five of 6 patients treated with synthetic vitamin B_6 were definitely benefited as to muscular strength. No toxic effects were noted. Apparently this vitamin has a stimulating effect on muscular action.

HEERSMA, Kalamazoo, Mich.

SERUM PHOSPHATASE IN THE LYMPHOMATOID DISEASES. H. Q. WOODARD and LLOYD F. CRAVER, J. Clin. Investigation **19**:1 (Jan.) 1940.

Studies of serum phosphatase were made on 115 adult patients with lymphomatoid disease: 53 with Hodgkin's disease, 28 with lymphosarcoma, 26 with leukemia and 8 with miscellaneous disorders. The authors point out that it is difficult to evaluate data on serum phosphatase in growing children, owing to the wide range of normal variation. Sodium glycerophosphate was used as the substrate. The alkaline serum phosphatase was found elevated frequently in cases of Hodgkin's disease but less often in cases of lymphosarcoma and the leukemias. Abnormalities in the acid serum phosphatase were not found.

The results were interpreted to indicate that osseous involvement is much more common in these diseases than the incidence of overt lesions would indicate.

GUEST, Cincinnati.

EXPERIMENTAL ARTHRITIS IN THE ALBINO RAT PRODUCED BY A GROUP A HEMOLYTIC STREPTOCOCCUS. S. ROTHBARD, Proc. Soc. Exper. Biol. & Med. **44**:379 (June) 1940.

When 0.5 cc. of an eighteen hour broth culture of hemolytic streptococcus group A, unclassified type, isolated recently from a patient with septicemia, was injected into rats weighing 70 to 100 Gm., arthritis occurred in 100 per cent of the animals, and when 0.1 cc. was given, it occurred in 70 per cent. The arthritis was multiple and began as early as forty-eight hours after injection, new joints showing involvement in succession for eight days. The diseased joints are swollen, dusky red, hot and painful to palpation. Streptococci are demonstrable on smears

of the synovial fluid, are cultured without difficulty and when reinjected into other animals reproduce the disease. The blood cultures are positive for five days after the injection. This multiple arthritis occurred in 45 of 51 animals, and in 5 rats acute monocular purulent endophthalmitis was present.

HANSEN, Minneapolis.

CONGENITAL DISLOCATION OF LEFT HIP. PERTHES' DISEASE OF RIGHT HIP. A. T. FRIPP, Proc. Roy. Soc. Med. **33**:530 (June) 1940.

The case of a girl of 7 years is reported. In February 1938 the mother said that she had noticed a limp on the right side for some weeks. No abnormality of the left leg had been noticed. Roentgenograms showed congenital dislocation of the left hip and advanced Perthes' disease of the right. Extension was applied to the left leg for three weeks, and the dislocation then was reduced by manipulation. At present the patient is walking with a patten-ended caliper on the right leg. The roentgenograms show satisfactory position of the left hip and regeneration of the right hip with considerable flattening of the head of the femur. The report is accompanied by roentgenograms of the original and the present condition.

WILLIAMSON, New Orleans.

OBSERVATIONS ON STILL'S DISEASE AND ON PRIMARY CHRONIC POLYARTHRITIS IN CHILDREN. EDMUND NOBEL, Ann. pædiat. **155**:160 (June) 1940.

1. Enlargement of the spleen is by no means a constant feature of Still's disease.

2. There is no causal connection between Still's disease and tuberculosis; normal leukocyte counts may alternate with marked leukocytosis.

3. It is possible that a deficiency of vitamins (B_1?) plays a much greater part in the causation of both these diseases than is generally recognized, though the clinical aspects of the two may be very different. It would seem that treatment with the antineuritic vitamin is successful in cases of chronic diseases of joints in children as well as in the more familiar treatment of polyneuritis, hypervitaminosis of pregnancy, gastroenteritis, neuralgia and sciatica.

AUTHOR'S SUMMMARY.

IS DELAY IN THE DEVELOPMENT OF THE OSSEOUS CENTERS PATHOGNOMONIC OF THYROID HYPOFUNCTION? O. GABINUS, Acta pædiat. **25**:59, 1939.

A 2 year old boy showed marked retardation of static functions, delayed dentition and complete absence of ossification of the carpal bones. A pneumoencephalogram indicated defective development of the brain. Evidence of hypothyroidism and of rickets was lacking; the level of plasma cholesterol was normal. After discussion of several possible explanations, the opinion is expressed that the defective ossification was due to a lesion of the brain.

MCCUNE, New York.

Skin Diseases; Allergy

VON RECKLINGHAUSEN'S NEUROFIBROMATOSIS WITH BONE MANIFESTATIONS. ERICH UHLMANN and ABRAHAM GROSSMAN, Ann. Int. Med. **14**:225 (Aug.) 1940.

Two cases are reported, in 1 of which cystic changes were exhibited in the mandible; in the other there was gigantism associated with elephantiasis of the lower extremity and osteoporosis, decalcification and atrophy of the cervical vertebrae.

The patients were both girls, aged 2 and 16 years respectively.

The literature is reviewed.

READING, Galveston, Texas.

ALLERGIC SYNDROMES IN THE ABSENCE OF ALLERGENS. H. L. ALEXANDER, J. Allergy **11**:163 (Jan.) 1940.

This is a thought-provoking article which discusses that group of persons with bronchial asthma, vasomotor rhinitis or chronic urticaria in whose cases the extrinsic factors are controlled and for whose sensitivity some intrinsic factor must be the cause.

The author discusses Lewis' work on the production of histamine or a histamine-like substance by the stimulation of a new set of nerve fibers discovered in the skin and in the mucous membrane of the upper respiratory tract, the "nocifensor nervous system."

He attempts to show the significance of the production of chronic urticaria, and he feels that the subject is worthy of more attention and study.

HOYER, Cincinnati.

GRANULOMA ANNULARE? LUPUS VULGARIS? F. S. AIREY, Proc. Roy. Soc. Med. **33**:582 (July) 1940.

In September 1938 a boy of 9 years suffered an attack of tonsillitis, after which cervical adenitis commenced. Three months later tonsillectomy was performed, but the adenitis did not decrease. A year later the boy had mumps. The acute stage soon subsided, but the gland became much larger and remained so. A few months later the mother noticed similar lesions on the skin, first over the bridge of the nose. Within six weeks they had come and gone, learving a fine scar. Two other lesions, over the sternum and the xiphisternum, soon appeared, and a similar course ensued. Lesions also appeared on the arms. In February 1940 a diagnosis of lupus vulgaris was made by a general practitioner. The boy was given the light treatment. As the course terminated, a papular eruption of a more generalized character appeared on the buttocks, thighs, face and arms. In March 1940 he was seen by the author, who removed tissue from the patches on the arm and made sections. No tubercle bacilli were found. The complement fixation reaction for tubercle bacilli was strongly positive. Typical giant cells, epithelioid cells and small round cells were seen in the deeper layers of the corium. Immediately on looking at the lesions the diagnosis of granuloma annulare suggested itself to the writer, but he felt that the diagnosis of lupus vulgaris had to be considered.

WILLIAMSON, New Orleans.

PROLONGED FORMS AND SEQUELAE OF ACRODYNIA. ROBERT CLÉMENT, Paris méd. **2**:301 (Dec. 2-9) 1939.

Thirty-three cases of acrodynia have been followed by the author. Three patients recovered within six months, 4 between six months and one year, 4 between one and two years, 4 between two and three years and 1 after four years. Nine cases are still under observation, in 3 of which the condition has already lasted over two years. A detailed discussion of symptoms and signs is given. He suggests that emotional instability may be a more or less permanent sequela of acrodynia.

LESLIE, Evanston, Ill.

IMPETIGO IN THE CHILD. WERTHEIMER, Paris méd. **2**:304 (Dec. 2-9) 1939.

The author emphasizes the frequency with which some underlying condition, such as scabies, interferes with cure and favors spread of the impetigo. In all cases, particularly when the condition does not respond readily, some such underlying factor should be searched for and eliminated. Treatment is discussed in detail.

LESLIE, Evanston, Ill.

THE CHOLESTEROL AND CHOLESTEROL ESTER CONTENT OF XANTHOMAS AND THEIR ISOLATION. WILHELM DIRSCHERL, Ztschr. f. physiol. Chem. **264**:34 (May 1) 1940.

Chemical study of multiple xanthomatous cutaneous lesions revealed that the value for total cholesterol was 3.7 per cent of the dry weight, with 2 per cent free and 1.7 per cent bound cholesterol. The cholesterol esters were composed mostly of cholesterol oleate and some cholesterol palmitate, with a small amount of cholesterol stearate.

HANSEN, Minneapolis.

RENAL IRRITATION IN ERYTHEMA NODOSUM. A. WALLGREN, Acta pædiat. **25**: 331, 1939.

In the course of the febrile toxic-allergic stage of divers infections that produce erythema nodosum, evidences of renal irritation may become manifest; these are usually subclinical, although they sometimes reach the proportions of acute nephritis. These phenomena may be regarded as the renal analog of the exudative lesions evoked by alteration of capillary permeability in the skin.

McCUNE, New York.

Teeth and Dentistry

FIRST DENTITION IN RELATION TO SOCIAL STRATUMS IN A CITY: A CONTRIBUTION TO THE QUESTION OF ACCELERATION. H. SATTLER, Ztschr. f. Kinderh. **61**:591 (Feb. 17) 1940.

In the recent lively discussion regarding the accelerated maturation of present day youth, an acceleration of dentition has also been reported.

The author's studies revealed that even under similar nutritional conditions and in the absence of rickets, dentition was earlier among infants and among mothers of the better situated classes. Further, dentition occurred earlier among infants than among mothers. The reason for these findings is supposed to be a stimulating effect of city life on persons who are more sensitive and are found in the upper social stratums. Intermarriage supposedly accentuates the tendency.

SIEMSEN, Chicago.

PEDIATRIC RESPONSIBILITIES FOR DENTAL CARE. C. W. HERLITZ, Acta pædiat. **25**:129, 1939.

The author voices a plea for closer cooperation between the pediatrician and the dentist and tells how this is accomplished at the Eastman Institute in Stockholm. What he does not describe is how to get enough free or low-priced dental care to make the plan work everywhere.

McCUNE, New York.

STATE OF NUTRITION AND DENTAL CARIES. I. JUNDELL and V. BERLIN, Acta pædiat. **26**:226, 1939.

Investigation of a group of school children who received superior dental care and whose general physical development was carefully observed revealed no clear-cut evidence of a relation between the state of nutrition and the frequency of dental caries.

McCUNE, New York.

SIGNIFICANCE OF PRESERVATION OF THE DECIDUOUS DENTURE. B. ROOS, Acta pædiat. **26**:362, 1939.

The milk teeth have the functions of preparing the food for digestion, of preserving a place for the permanent teeth and, by fostering the act of chewing, of contributing to the development of the jaws. In addition, they are an aid to clear speech. The milk teeth are menaced by partial or complete caries of the crown

and infection of the pulp. Neglected decay of the deciduous teeth can lead to damage to the unerupted permanent teeth. These and other reasons constitute adequate support for the point of view that the health of the milk teeth should not be neglected and justify the organization of dental service for children.

The bibliography is unusually serviceable.

McCUNE, New York

Miscellaneous

THE NATURE OF THE RENAL LESION WITH SULFAPYRIDINE THERAPY. WALTER A. STRYKER, J. A. M. A. **114**:953 (March 16) 1940.

Pathologic studies were made of the kidneys of a 5 month old infant who died of pneumococcic meningitis and renal complications of sulfapyridine therapy. By a rapid process of fixation the precipitated material which produces tubular obstruction was demonstrated. Previous methods had probably dissolved this material in the water base used. To prevent this precipitation of sulfapyridine products in the kidney tubules, where concentration of urine occurs, greater excretion of urine and possibly alkalization are beneficial.

HEERSMA, Kalamazoo, Mich.

THE RELATION OF METHEMOGLOBIN TO THE CYANOSIS OBSERVED AFTER SULFANILAMIDE ADMINISTRATION. IRWIN VIGNESS, C. J. WATSON and W. W. SPINK, J. Clin. Investigation **19**:83 (Jan.) 1940.

The cyanosis observed in man following sulfanilamide therapy is explained by the presence of methemoglobin (rarely sulfhemoglobin).

Methylene blue abolished the cyanosis due to methemoglobin (and other pigments if present, except sulfhemoglobin), and the spectral distribution curve of the blood became normal.

GUEST, Cincinnati.

THE OCCURRENCE OF METHEMOGLOBINEMIA DURING SULFANILAMIDE THERAPY. CHARLES L. FOX JR. and JAMES E. CLINE, J. Clin. Investigation **19**:123 (Jan.) 1940.

The occurrence of methemoglobin and sulfhemoglobin in the blood of sulfanilamide-treated patients is indicated by curves drawn by the Hardy recording spectrophotometer.

An explanation for the occurrence of methemoglobin in the blood of sulfanilamide-treated patients is provided by the demonstration in vitro of the conversion of hemoglobin to methemoglobin by certain oxidation products of sulfanilamide.

GUEST, Cincinnati.

"ANASALU" OR A SYMPTOM-COMPLEX AFFECTING THE NURSLINGS. D. V. S. REDDY, Indian J. Pediat. **7**:57 (April) 1940.

A group of cases are reported and are said to represent the symptom complex known as anasalu. The clinical picture was variable and involved the nervous system and the respiratory system as well as the gastrointestinal tract. The hospital records included notes of deaths from bronchopneumonia, colic and gastroenteritis with collapse. Obviously such an ill defined symptom complex requires much study. Among the questions raised are: Is there any relation with the known prevalence of beri-beri in the community? Has the habit of cigar smoking by women in this community any significance in the etiology of the disturbance?

TENNEY, Madison, Wis.

A USEFUL APPARATUS FOR PROVIDING WARMTH IN THE CARE OF WEAK INFANTS. G. LINDBERG, Acta pædiat. **25**:164, 1939.

An electrically heated, thermostatically controlled canopy of cotton is described. It can be placed over the infant as he lies in bed. It provides by convection the circulation of air warmed to a temperature that allows the infant to remain unclothed. Since the air enters the canopy through the cotton walls, some measure of isolation from infection is attained. No provision is made for regulating the moisture content of the air.

McCUNE, New York.

CHILDREN'S SHOES. P. J. NORDENFELT, Acta pædiat. **25**:220, 1939.

The modern point of view which regards the shoe as a garment rather than as an orthopedic device is gaining acceptance in many quarters. Hohmann, Thomsen, Ullmann, Basler and others deny the validity of the formerly well nigh universal postulate that the child's foot requires the so-called support provided by the heavy rigid high shoe. Going further, they submit evidence of the hindrance to and distortion of function that results from binding undeveloped feet in the nonbiologic type of casing which enjoys international vogue in civilized countries. Whenever possible children should go barefoot; an uneven terrain is desirable, but restriction to the flat floors of a house does not require that the recommendation be altered, for the reason that children do not stand long in one position but are constantly in motion. Severity of climate is the principal indication for shoes in most parts of the world. The nomadic Lapps solve the problem by wearing soft, pliable boots and use fine dry grass in place of stockings. Soft shoes are being developed independently in widely separated regions. The author describes a flexible, heelless, inexpensive low shoe that is being put on the market through the cooperation of one of the large Swedish manufacturers. The brief bibliography is useful, although the titles refer principally to papers written in the German language.

McCUNE, New York.

CORRECTION

In the article by Drs. J. D. Russ and Robert A. Strong entitled "Resuscitation of the Asphyxiated Newborn Infant," in the January issue (AM. J. DIS. CHILD. **61**:1, 1941), the name Easton and Johnson, which appears several times in the article, should read E and J (Erickson and Johnstone).

Society Transactions

NATIONAL FOUNDATION FOR INFANTILE PARALYSIS

BASIL O'CONNOR, *President*

PETER J. A. CUSACK, *Executive Secretary*

Annual Medical Meeting, New York, Nov. 7-8, 1940

The National Foundation for Infantile Paralysis held its first annual medical meeting at the Waldorf-Astoria Hotel in New York, on Nov. 7 and 8, 1940. The members of the medical advisory committees, the grantees of the Foundation and the members of the board of trustees attended the meeting. Reports of the activities of the committees and the grantees for the preceding year were presented, and recommendations were made for grants for 1940-1941.

The Foundation is concerned with the promotion and furtherance of research on all phases of infantile paralysis. Studies are being carried on through grants from the Foundation on epidemiology, the poliomyelitis virus, the relation of nutrition to poliomyelitis and the prevention and treatment of the disease. In addition, a program of professional and lay education has been promoted.

RESEARCH ON THE VIRUS

The Committee on Virus Research reported that studies were being conducted to determine the nature of the poliomyelitis virus. Paul F. Clark, Ph.D., of the University of Wisconsin, has concentrated the virus-infected material obtained from the spinal cords of monkeys so that infection may be produced by a dilution of 1 : 10,000,000. Dr. Hubert S. Loring, of Leland Stanford University, who has been studying the purified and concentrated virus, has concluded that the virus is protein in nature or contains protein material. Study of the properties and chemical nature of the virus will be continued.

Drs. John R. Paul and James D. Trask, of Yale University School of Medicine, reported the finding of the poliomyelitis virus in the stools of patients and of contacts and in sewage collected from epidemic areas. Dr. S. D. Kramer, of the laboratories of the Michigan department of health, reported the discovery of healthy carriers during an institutional outbreak in Detroit. Karl F. Meyer, Ph.D., and Beatrice Howitt, of the George Williams Hooper Foundation of the University of California, reported on their detailed laboratory studies on material collected from patients and contacts and from the environmental area during an epidemic in Tacoma, Wash.

Reports were made on efforts to produce infection with poliomyelitis viruses in animals other than monkeys. Results confirmed the previously reported observations of Armstrong to the effect that the Lansing strain could produce infection in various species of cotton rats. All investigators except Dr. John A. Toomey, of the Western Reserve University School of Medicine, reported that only this one strain could produce the disease in the cotton rat. Toomey, however, by a special technic successfully grew several other old strains, as well as some newly isolated strains, in the cotton rat. This result may be of the utmost importance for the conduct of further clinical and epidemiologic studies.

The distribution of the virus in the body was reported on by Drs. R. D. Lillie, of the National Institute of Health, Washington, D. C.; Albert B. Sabin, of the University of Cincinnati, and John F. Kessel, of the University of Southern California, and others. All reported that the virus could be routinely recovered from

tissues of the central nervous system of persons dying of the disease and of experimental animals and that, except for the tonsils, the adenoids and the lymph gland tissue, no other part of the body has been shown to harbor the virus.

STUDIES ON IMMUNITY

Results of studies on the development of active and passive immunity were reported. All attempts at producing immunity have thus far met with failure. Dr. Kessel reported that one infection did not routinely protect monkeys from subsequent disease on reinoculation. He also made the observation that there was but little relation between the presence of neutralizing antibodies in the blood stream and immunity to the disease.

CHEMOTHERAPY

Studies in chemotherapy were reported by C. C. Young, Ph.D., and Dr. S. D. Kramer, of the laboratories of the Michigan department of health. While they have not found a chemical that will accomplish in the treatment of poliomyelitis what sulfanilamide has accomplished in the therapy of certain bacterial infections, they have some clues which will be the subject of further investigation.

INVESTIGATIONS ON AFTER-EFFECTS

Reports were received from grantees who are studying both the effects of the disease and the methods for the prevention of damaging effects. Dr. Donald Young Solandt, of the University of Toronto, has concluded that the muscular fibrillation resulting from nerve destruction is not the primary cause of atrophy of paralyzed muscle. Dr. Clinton N. Woolsey, of the Johns Hopkins University School of Medicine, concurred in these results, but Dr. Samuel Soskin, of Michael Reese Hospital, Chicago, expressed the belief that in the animals which he studied fibrillation did play an important part in determining the degree of atrophy resulting from nerve destruction.

Physiologic changes in muscular atrophy are being studied by Dr. I. Arthur Mirsky at the Jewish Hospital in Cincinnati, by Dr. A. T. Milhorat at the Russell Sage Institute for Pathology in New York and by Prof. Harry M. Hines at the State University of Iowa. None of these workers has pursued the investigations far enough to warrant coming to any definite conclusions.

Gross and microscopic pathologic studies of paralyzed muscles carried out by Dr. Herbert E. Hipps, of the Crippled Children Hospital, Marlin, Texas, have shown that occasionally a bandlike form of degeneration develops in muscles and that when mattress sutures are used to connect the muscle above and below these bands good functional results are obtained.

Reports on several instruments for the more accurate testing of muscle strengths were presented. Dr. A. A. Schmier, of the Hospital for Joint Diseases, New York, has developed a muscle-testing apparatus which is suitable for measuring and recording in pounds and ounces the pulling power of most of the muscles of the body. Dr. Leo Mayer, of the same hospital, has evolved a table designed to evaluate in the same terms the muscle power of the trunk.

SURGICAL TREATMENT

Several studies have been completed and others are being conducted that measure the end results of various forms of surgical and conservative treatment. Drs. George E. Bennett and Raymond E. Lenhard, of the Children's Hospital School, Baltimore, have concluded that if the maximum benefits of physical therapy are to be secured patients must be under such care within six months of the onset of the disease. They further showed that 97 per cent of all weakened or paralyzed muscles regain their maximum possible strength within eighteen months of the onset of treatment. Dr. William B. Carrell, of the Texas Scottish Rite Hospital, Dallas, Texas, confirmed these observations. In addition, he has concluded that rest with physical therapy in the hospital has no advantage over similar treatments

given in the home. Hospital care over long periods is of decided advantage only when underwater treatments are used. Dr. Carrell also pointed out the disadvantages of continuing plaster casts over periods of from four to six months, even when the patients report for frequent reapplications of the casts.

The value of rest treatment was further emphasized by laboratory studies on infected monkeys. Dr. Sidney O. Levinson, of the Michael Reese Hospital, Chicago, has shown that among monkeys forced to exercise during the active period of the disease there was not only a greater amount of paralysis but a higher death rate.

Much study has been devoted to the bony deformity, such as scoliosis and unequal leg lengths, resulting from attacks of infantile paralysis. Since years of observation of individual patients are necessary, only reports of progress could be made at this meeting.

EPIDEMIOLOGY

Reports were rendered on the activities of the Foundation in epidemic areas. It is not the purpose of the Foundation to provide medical care for patients; yet it has rendered certain assistance to communities and to hospitals by supplying splints and Bradford frames and by making respirators available. Studies of epidemics were made in a few areas on the request and with the consent of the health officers. These studies have progressed only far enough to point the way for more elaborate and exhaustive work in the future.

EDUCATIONAL ACTIVITIES

To inform both professional workers and the public of certain aspects of this disease an educational program has been conducted. An exhibit at the New York World's Fair was viewed by over 5,000,000 persons. Scholarships have been made available through the National Research Council to physicians wishing to specialize in orthopedic surgery or virology. Other scholarships have been made available to nurses wishing to specialize in the orthopedic aspects of public health nursing. Graduate instruction in physical therapy also has been provided.

Booklets dealing with the use of the respirator, the nursing care of poliomyelitis patients and other phases of the problem of infantile paralysis have been prepared and widely distributed.

Scientific investigation of the possible relation of the state of nutrition to the development of infantile paralysis has been undertaken. It was deemed expedient not to limit these studies to poliomyelitis, but rather to include the entire field of infectious diseases.

At this meeting additional grants, in the amount of $137,350, were recommended for continuing existing studies or beginning new investigations.

As the result of elections, the following chairmen of medical committees were appointed: the Committee on Virus Research, Thomas M. Rivers, M.D., director of the Hospital of the Rockefeller Institute for Medical Research, New York; the Committee on Research for the Prevention and Treatment of After-Effects, Philip Lewin, M.D., associate professor of orthopedic surgery, Northwestern University Medical School, Chicago; the Committee on Nutritional Research, James S. McLester, M.D., professor of medicine, University of Alabama School of Medicine, Birmingham, Ala.; the Committee on Epidemics and Public Health, Herman N. Bundesen, M.D., commissioner of health, Chicago; the Committee on Education, Max M. Peet, M.D., professor of surgery, University of Michigan Medical School, Ann Arbor, Mich., and the Committee of Medical Publications, Morris Fishbein, M.D., Editor, *The Journal of the American Medical Association*, Chicago.

Book Reviews

Manson's Tropical Diseases. Edited by Philip H. Manson-Bahr, C.M.G., D.S.O., M.A., M.D., D.T.M., and H. Cantab., F.R.C.P., Lond. Eleventh Edition, Revised. Price, $11. Pp. 1,043, with 397 illustrations (18 in color), 6 maps and 28 charts. Baltimore: The Williams & Wilkins Company, 1940.

The name of Philip H. Manson-Bahr has been inseparable from progress in the constantly widening field of tropical medicine for so many years that it is difficult even for those who have long been interested in diseases peculiar to the torrid and temperate zones to regard this eleventh edition of Sir Patrick Manson's "Tropical Diseases" as anything other than a contribution of the editor himself. When it is considered that this book is the fifth of a series which has been thoroughly revised by him, it can readily be understood that it contains little, if any, of the original material. Nevertheless, the idea of Sir Patrick that it should be a manual on the diseases of warm climates, of handy size, yet giving adequate information, has been perpetuated in this eleventh edition. This has been achieved by Manson-Bahr notwithstanding the revolutionary changes in the conception of tropical diseases which have occurred since the appearance of the first edition. The present author has accomplished the difficult task of writing a book in which a maximum of worth while information is to be found in a minimum of space.

The contents of the book are conveniently arranged in ten sections, further divided into subsections, which facilitates the finding of subject matter, often without the necessity of using the carefully prepared index. In addition, there are two introductory chapters and an appendix devoted to medical zoology and laboratory methods.

The introductory chapters are on the preparation for life in the tropics and enumerate the minimum physical requirements of those contemplating residing there. The discussion on clothing, exercising, sleeping and eating to insure bodily comfort are probably useful to those who have never lived away from England, but they are not necessary to any one who has experienced North American summers. The brief but thorough discussion on nutrition in the tropics, which forms a part of the second introductory chapter, is informative as to desirable sources of food in the tropics, but otherwise the physiologic fundamentals discussed are not peculiar to the tropics. In the same chapter, an unnecessary amount of space is devoted to the tropical anemias, because included under this heading are macrocytic anemia of pregnancy, nutritional macrocytic anemia, sickle cell anemia and Cooley's anemia, which are not confined to the tropics; this overlong section is made especially unnecessary by Foster's recent report of a case of Cooley's syndrome (erythroblastic anemia) in a Chinese child (*Am. J. Dis. Child.* **59**:828 [April] 1940).

The first section of the book is devoted to fevers and is divided into five subdivisions. The first chapter in subsection A, on malaria, is the "classic" which would be expected from Manson-Bahr, who has personally contributed so much to every phase of study of this most important and still too prevalent disease. It is an encyclopedic dissertation on malaria which leaves nothing to be desired. The illustrations, including 2 colored plates, so amplify the already clear description of this disease that it is possible for one who knows nothing of malaria to become easily and authoritatively enlightened. Plague, tularemia and the undulant fevers discussed are especially interesting and comprehensively covered in subsection D. Yellow fever leads the list of febrile diseases due to viruses discussed in subsection E. On a map of its geographic distribution, it is astonishing to note the extensive areas, in Mexico, Cuba, the West Indian possessions, all of Central America and a large part of South America, where this disease is endemic at present or where it has been shown by the "protection test" that many residents of the present generation have had the disease. This test for endemicity is based on the fact that after an attack of yellow fever immune bodies are present in

human serum for life and that when a mixture of such immune serum and virus is injected into a susceptible rhesus monkey, the monkey will not die if the serum contains immune bodies capable of neutralizing the virus. By the application of this test with serum obtained from residents of Central East Africa, Central America and South America, the conclusion has been drawn that the incidence of yellow fever in the present generation has been much more widespread than was previously imagined.

The section on vitamin deficiency diseases includes every discovery of recognized value up to the date of printing. Other features are complete discussions of the dysenteries, the animal parasites and associated diseases. The reader will find everything he wishes to know concerning these important tropical and semitropical conditions. In the appendix, all laboratory methods necessary for diagnosis are completely discussed and adequately illustrated.

In addition to being an authoritative and complete source of information on tropical diseases, this work aids the reader in comprehending the author's meaning by a type face and typographic makeup which require the least amount of ocular effort.

This eleventh revision of Manson's "Tropical Diseases" will in every way maintain the reputation of previous editions, and it will continue to be regarded as indispensable to practitioners in the tropics. Moreover, since so many of the diseases it authoritatively discusses are now being transmitted to temperate zones through increased and more rapid transportation, it is a book from which any practicing physician can obtain helpful information.

The 1940 Year Book of Public Health. Edited by J. C. Geiger, M.D. Price, $3. Pp. 560, with 12 illustrations. Chicago: The Year Book Publishers, Inc., 1940.

For the first time a year book on public health has been added to the series of year books on other medical subjects which have appeared for many years. This book consists of abstracts of papers on the public health which have appeared in publications all over the world during the past year. The subjects covered include communicable diseases and epidemiology, food and milk, nutrition, housing, statistics, laboratory studies, industrial hygiene, public health administration, health education and child hygiene. The most important papers in each field have been abstracted and editorial comments added. This book will be of great value to persons engaged in public health work, for it makes available in brief, readable form many papers which they otherwise might not read. The reader is brought up to date on the latest developments in all aspects of public health.

The editor, who has had many years of experience as a public health administrator, has done an outstanding service in selecting papers which are of the greatest practical value. In addition to its value to the public health worker, the book should be even more valuable to the practitioner of medicine who wishes to keep in touch with developments in this rapidly growing field. The book is compact and well set up and should be received with enthusiasm.

Physiology of the Fetus. By William Frederick Windle. Price, cloth, $4.50. Pp. 249, with 70 illustrations. Philadelphia: W. B. Saunders Company, 1940.

It is hard for a pediatrician to evaluate this book. One can certainly say that the subject is one which should be discussed by pediatricians. One may also say that this is a fine discussion of the subject and that there is much in it which should be of value to any pediatrician, especially to one who has much to do with premature infants. The trouble is not with the book but with the pediatrician, who has not thought in embryologic terms and therefore may find himself confused in reading some of the text. However, thanks are due Dr. Windle for bringing out a book on a long-neglected subject. The book is well written and well annotated; the chapters on the nervous system especially are highly commendable. It is to be hoped that this book will stimulate others to make investigations along this line.

Directory of Pediatric Societies

INTERNATIONAL

International Association of Preventive Pediatrics

President: Prof. S. Monrad, Dronning Louises Børnehospital, Copenhagen, Denmark.
Secretary: Dr. Daniel Oltramare, 15 Rue Lévrier, Geneva, Switzerland.

International Congress of Pediatrics

President: Dr. Henry F. Helmholz, Mayo Clinic, Rochester, Minn.
General Secretary: Dr. Kenneth D. Blackfan, 300 Longwood Ave., Boston.
Assistant Secretary-Treasurer: Dr. Charles F. McKhann, University of Michigan, Ann Arbor, Mich.

Canadian Committee:
Chairman: Dr. Alan Brown, Hospital for Sick Children, 67 College St., Toronto.
Secretary: Dr. H. P. Wright, 1509 Sherbrooke St. W., Montreal.
Place: Boston. Time: Postponed indefinitely.

International Congress for the Protection of Infancy

Secretary: Prof. G. B. Allaria, Corso Bramante 29, Torino 120, Italy.

FOREIGN

Argentine Pediatric Society of Buenos Aires

President: Dr. Martin Ramón Arana, 1809 Rodriguez Peña, Buenos Aires.
General Secretary: Dr. Alfredo Larguia, Cerrito 1179, Buenos Aires.

British Paediatric Association

President: Prof. Charles McNeil, 44 Heriot Row, Edinburgh, Scotland.
Secretary: Dr. Arthur G. Maitland Jones, 31A Weymouth St., London, W. 1.

Danish Pediatric Society

President: Dr. E. Lenstrup, Copenhagen.
Secretary: Dr. E. Gjørup, Dronning Louises Børnehospital, Copenhagen.

Nederlandsche Vereeniging voor Kindergeneeskunde

President: Prof. Dr. J. van Lookeren Campagne, Hofstraat 16, Gröningen, Holland.
Secretary: Dr. R. P. van de Kasteele, Laan van Poot 340, 's Gravenhage, Holland.
Place: Different places. Time: Three times a year.

Paediatrický Spolok na Slovensku

President: Dr. A. J. C. Chura, Lazaretská 11, Bratislava.
Secretary: Dr. P. Rados, Lazaretská 6, Bratislava.
Place: Pediatric Clinic, University Bratislava. Time: Six times a year.

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* Secretaries of societies are requested to furnish the information necessary to make this list complete and to keep it up to date.

ROYAL SOCIETY OF MEDICINE, SECTION FOR THE STUDY OF DISEASE IN CHILDREN

President: Dr. E. A. Cockayne, 98 Harley St., London, W. 1, England.
Secretary: Dr. R. Lightwood, 86 Brook St., London, W. 1, England.
Place: 1 Wimpole St., London. Time: Fourth Friday of each month, 4:15 p. m.

PALESTINE JEWISH MEDICAL ASSOCIATION, SECTION OF PHYSICIANS OF CHILDREN'S DISEASES

President: Prof. S. Rosenbaum, 26 Bialikstr., Tel Aviv.
Secretary: Dr. A. Brünn, 9 Maazestre, Tel Aviv.

SOCIEDAD CUBANA DE PEDIATRÍA

President: Dr. Clemente Inclan Costa, Manrique 48, Habana.
Secretary: Dr. Serafin Falcon Lopez, Calle B No. 356, Vedado, Habana.
Place: Cátedra de Clinica Infantil, Hospital Mercedes, Habana. Time: Last Wednesday of every month.

SOCIEDAD MEXICANA DE PEDIATRIA

President: Dr. Jorge Muñoz Turnbull, Av. Alvaro Obregón 186, Mexico, D. F.
Secretary: Dr. Fernando López Clares, Medellín 191, Mexico, D. F.

SOCIÉTÉ DE PÉDIATRIE DE PARIS

President: Dr. B. Weill-Hallé, 49 Avenue Raymond Poincaré, Paris, France.
Secretary: Dr. Jean Hallé, 10 bis Rue du Pré aux Clercs, Paris, France.
Place: Hôpital des Enfants Malades, 49 Rue de Sèvres. Time: 4:30 p. m., third Thursday of every month.

URUGUAYAN SOCIETY OF PEDIATRICS

President: Dr. Conrado Pelfort, Av. 18 de Julio 1246, Montevideo.
Secretary: Dr. Héctor Mourigan, Av. 18 de Julio 2175, Montevideo.

NATIONAL

AMERICAN MEDICAL ASSOCIATION, SCIENTIFIC ASSEMBLY, SECTION ON PEDIATRICS

Chairman: Dr. Julius H. Hess, 104 S. Michigan Ave., Chicago.
Secretary: Dr. Hugh L. Dwyer, 315 Alameda Rd., Kansas City, Mo.
Place: Cleveland. Time: June 2-6, 1941.

AMERICAN ACADEMY OF PEDIATRICS

President: Dr. J. B. Bilderback, 1020 S. W. Taylor St., Portland, Ore.
Secretary: Dr. Clifford G. Grulee, 636 Church St., Evanston, Ill.
Place: Statler Hotel, Boston. Time: Oct. 9-11, 1941.
Region I. Place: Hotel Taft, New Haven, Conn. Time: March 27-29, 1941.
Region II. Place: John Marshall Hotel, Richmond, Va. Time: April 24-25, 1941.
Region III. Place: Palmer House, Chicago. Time: May 15-17, 1941.
Region IV. Place: Fairmont Hotel, San Francisco. Time: May 1-3, 1941.

AMERICAN HOSPITAL ASSOCIATION, CHILDREN'S HOSPITAL SECTION

Chairman: Dr. D. L. Richardson, 593 Eddy St., Providence, R. I.
Secretary: Dr. Joelle C. Hiebert, 299 Main St., Lewiston, Maine.

AMERICAN PEDIATRIC SOCIETY

President: Dr. Thomas B. Cooley, 1728 Seminole Ave., Detroit.
Secretary-Treasurer: Dr. Hugh McCulloch, 325 N. Euclid Ave., St. Louis.
Place: Hot Springs, Va. Time: May 22-24, 1941.

CANADIAN SOCIETY FOR THE STUDY OF DISEASES OF CHILDREN

President: Dr. L. M. Lindsay, 815 Medical Arts Bldg., Montreal.
Secretary-Treasurer: Dr. Elizabeth Chant Robertson, Hospital for Sick Children, Toronto.

SOCIETY FOR PEDIATRIC RESEARCH

President: Dr. A. Ashley Weech, 3975 Broadway, New York.
Secretary: Dr. Mitchell I. Rubin, 1740 Bainbridge St., Philadelphia.
Place: Chalfonte-Haddon Hall Hotel, Atlantic City, N. J. Time: May 6-7, 1941.

SECTIONAL

INTERMOUNTAIN PEDIATRIC SOCIETY

President: Dr. Eugene Smith, 385–24th St., Ogden, Utah.
Secretary-Treasurer: Dr. W. C. Cheney, 837 Boston Bldg., Salt Lake City.
Place: Salt Lake City General Hospital. Time: First Thursday of each month, 8 p. m.

NEW ENGLAND PEDIATRIC SOCIETY

President: Dr. R. Cannon Eley, 319 Longwood Ave., Boston.
Secretary-Treasurer: Dr. James Marvin Baty, 319 Longwood Ave., Boston.
Place: Boston Medical Library. Time: Four meetings a year, occurring from September to May.

NORTH PACIFIC PEDIATRIC SOCIETY

President: Dr. S. G. Henricke, 4215 N. E. Hancock St., Portland, Ore.
Secretary: Dr. J. S. Backstrand, 333 Wyatt Court, Salem, Ore.
Place: Doernbecker Hospital and University of Oregon Medical School, Portland. Time: Jan. 25, 1941.

ROCKY MOUNTAIN PEDIATRIC SOCIETY

President: Dr. Donn Barber, 802½–8th Ave., Greeley, Colo.
Secretary: Dr. Kenneth Schmidt, Republic Bldg., Denver.
Place: Children's Hospital, Denver. Time: First Saturday of each month from September to May, inclusive, 7:30 p. m.

SOUTHERN MEDICAL ASSOCIATION, SECTION OF PEDIATRICS

Chairman: Dr. Harvey F. Garrison, 319 E. Capitol St., Jackson, Miss.
Secretary: Dr. Warren W. Quillian, 227 Aragon Ave., Coral Gables, Fla.

STATE

ALABAMA PEDIATRIC SOCIETY

President: Dr. M. V. Adams, 803 Government St., Mobile.
Secretary-Treasurer: Dr. William R. Britton, 4 Catoma St., Montgomery.

ARKANSAS STATE PEDIATRIC ASSOCIATION

Chairman: Dr. C. B. Billingsley, 1425 N. 11th St., Fort Smith.
Secretary: Dr. R. E. Weddington, 1425 N. 11th St., Fort Smith.

CALIFORNIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

Chairman: Dr. William Belford, 233 A St., San Diego.
Secretary: Dr. John J. Miller Jr., 2398 Sacramento St., San Francisco.
Place: Del Monte. Time: May 1941.

Florida State Pediatric Society

President: Dr. Warren W. Quillian, 227 Aragon Ave., Coral Gables.
Secretary: Dr. George N. Leonard, 605 Lincoln Rd., Miami Beach.
Place: Concurrent with state association meeting at time of convention.

Georgia Pediatric Society

President: Dr. R. C. McGahee, 1345 Greene St., Augusta.
Secretary-Treasurer: Dr. Don F. Cathcart, 478 Peachtree St. N. E., Atlanta.

Hezekiah Beardsley Pediatric Club of Connecticut

President: Dr. D. C. Darrow, 789 Howard Ave., New Haven.
Secretary: Dr. Joseph L. Hetzel, 103 N. Main St., Waterbury.
Time: Three meetings a year.

Illinois State Medical Society, Section on Pediatrics

Chairman: Dr. Orville Barbour, 331 Fulton St., Peoria.
Secretary: Dr. Craig Butler, 715 Lake St., Oak Park.
Place: Chicago. Time: May 1941.

Indiana State Pediatric Society

President: Dr. K. T. Knode, 1105 E. Jefferson Blvd., South Bend.
Secretary-Treasurer: Dr. Mathew Winters, 621 Hume Mansur Bldg., Indianapolis.
Time: Two meetings a year.

Iowa Pediatric Society

President: Dr. Morgan J. Foster, 837 Higley Bldg., Cedar Rapids.
Secretary-Treasurer: Dr. Arnold M. Smythe, 406–6th Ave., Des Moines.

Louisiana State Pediatric Society

President: Dr. H. Aubrey White, Alexandria.
Secretary-Treasurer: Dr. W. C. Rivenbark, 3503 Prytania St., New York.
Place: Shreveport. Time: April 1941.

Medical Society of State of New York, Section on Pediatrics

Chairman: Dr. Norman L. Hawkins, 11 Public Sq., Watertown, N. Y.
Secretary: Dr. William J. Orr, 135 Linwood Ave., Buffalo.

Medical Society of the State of Pennsylvania, Pediatric Section

Chairman: Dr. John D. Sturgeon Jr., 22 N. Gallatin Ave., Uniontown.
Secretary: Dr. Elwood W. Stitzel, 403 Central Trust Bldg., Altoona, Pa.
Place: Pittsburgh. Time: Sept. 29-Oct. 2, 1941.

Michigan State Medical Society, Pediatric Section

Chairman: Dr. Harry Towsley, University of Michigan Hospital, Ann Arbor.
Secretary: Dr. Leon DeVel, 110 E. Fulton, Grand Rapids.

Mississippi State Pediatric Society

President: Dr. Harvey F. Garrison Jr., 315 E. Capitol Pl., Jackson.
Secretary: Dr. Guy Verner, 126 N. Congress St., Jackson.
Place: Biloxi. Time: May 12, 1941.

Nebraska Pediatric Society

President: Dr. J. C. Iwersen, 236 Medical Arts Bldg., Omaha.
Secretary-Treasurer: Dr. Elmer W. Bantin, 440 Aquila Court Bldg., Omaha.
Place: As announced by Committee. Time: Third Thursday of each month from October to June, inclusive. Dinner at 6 p. m.

NEW HAMPSHIRE PEDIATRIC SOCIETY

President: Dr. MacLean J. Gill, 14 N. State St., Concord.
Secretary-Treasurer: Dr. Ursula G. Sanders, 46 Pleasant St., Concord.
Time: Twice yearly.

NORTH CAROLINA PEDIATRIC SOCIETY

President: Dr. Marion Y. Keith, 369 N. Elm St., Greensboro.
Secretary: Dr. G. W. Kutscher Jr., 176 Woodfin St., Asheville.

OKLAHOMA STATE PEDIATRIC SOCIETY

President: Dr. Ben H. Nicholson, 301 N.W. 12th St., Oklahoma City.
Secretary: Dr. Luvern Hays, 108 W. 6th St., Tulsa.
Place: Oklahoma Club. Time: 6:30 p. m., fourth Friday of each alternate month from September to May, inclusive.

SOUTH CAROLINA PEDIATRIC SOCIETY

President: Dr. R. B. Josey, 1517 Hampton Ave., Columbia.
Secretary-Treasurer: Dr. Wilson Ball, South Carolina State Health Dept., Columbia.

TENNESSEE STATE PEDIATRIC SOCIETY

President: Dr. Kinsey M. Buck, 1193 Madison Ave., Memphis.
Secretary: Dr. Gilbert Eblen, 611 W. Main Ave., Knoxville.

TEXAS PEDIATRIC SOCIETY

President: Dr. C. P. Jasperson, 509 Nixon Bldg., Corpus Christi.
Secretary-Treasurer: Dr. F. H. Lancaster, 4409 Fannin St., Houston.
Place: Fort Worth. Time: May 14, 1941.

VIRGINIA PEDIATRIC SOCIETY

President: Dr. John M. Bishop, 511 Medical Arts Bldg., Roanoke.
Secretary: Dr. Edwin A. Harper, 301 Rivermont Ave., Lynchburg.

WEST VIRGINIA STATE MEDICAL SOCIETY, SECTION ON PEDIATRICS

President: Dr. Theresa O. Snaith, 450 Center Ave., Weston.
Secretary: Dr. Henrietta L. Marquis, 211 Bair Bldg., Beckley.

LOCAL

ACADEMY OF MEDICINE OF CLEVELAND, PEDIATRIC SECTION

Chairman: Dr. J. D. Nourse, 10515 Carnegie Ave., Cleveland.
Secretary: Dr. I. B. Silber, 10465 Carnegie Ave., Cleveland.
Place: Cleveland Medical Library Bldg. Time: October, December, February and April.

ACADEMY OF MEDICINE, TORONTO, SECTION OF PEDIATRICS

President: Dr. I. Nelles Silverthorne, 170 St. George St., Toronto, Canada.
Secretary: Dr. G. P. Hamblin, 2333 Bloor St. W., Toronto, Canada.

BRONX PEDIATRIC SOCIETY

President: Dr. David Greene, 910 Grand Concourse, New York.
Secretary: Dr. F. E. Chick, 2325 University Ave., New York.
Place: Concourse Plaza Hotel, 161st St. and Grand Concourse. Time: Every second Wednesday of each month, except June, July, August and September.

Brooklyn Academy of Pediatrics

President: Dr. Archibald Smith, Garden City, N. Y.
Secretary: Dr. Walter Coles, 604–2d St., Brooklyn.
Place: Kings County Medical Society Bldg. Time: Fourth Wednesday of each month, except May, June, August and September.

Central New York Pediatric Club

President: Dr. Frank van der Bogert, 111 Union St., Schenectady.
Secretary: Dr. Frank J. Williams, 58 S. Swan St., Albany.
Places: Various cities in New York. Time: Third Tuesday of April and September.

Chicago Pediatric Society

President: Dr. Philip Rosenblum, 2376 E. 71st St., Chicago.
Secretary: Dr. Bengt Hamilton, 826 E. 61st St., Chicago.
Place: Children's Memorial Hospital, 710 Fullerton Ave. Time: Third Tuesday of each month, October to May, inclusive.

Dallas Pediatric Society

President: Dr. Edgar Loomis, 351 W. Jefferson Ave., Dallas, Texas.
Secretary-Treasurer: Dr. John E. Ashby, 3610 Fairmont Ave., Dallas, Texas.
Place: Bradford Baby Hospital. Time: 1 p. m., second and fourth Saturdays of each month.

Detroit Pediatric Society

President: Dr. Robert J. Mason, 460 Birmingham Rd., Birmingham, Mich.
Secretary: Dr. J. Hugh Lewis, 2966 Biddle Ave., Wyandotte, Mich.
Place: Wayne County Medical Society. Time: 8:30 p. m., first Wednesday of each month from October to June, inclusive.

Fulton County Medical Society, Pediatric Section (Atlanta, Ga.)

Chairman: Dr. Don F. Cathcart, 478 Peachtree St. N. E., Atlanta.
Secretary: Dr. Harry Lange, 478 Peachtree St. N. E., Atlanta.
Place: Academy of Medicine, 38 Prescott St. N. E. Time: Second Thursday of each month from October to April, 8 p. m.

Houston Pediatric Society

President: Dr. Thomas J. Donovan, 3820 Fannin St., Houston, Texas.
Secretary: Dr. Raymond Cohen, 2300 Caroline St., Houston, Texas.
Place: Houston Club. Time: Third Monday of each month.

Kansas City (Missouri) Pediatric Society

President: Dr. John Aull, 1103 Grand Ave., Kansas City.
Secretary: Dr. George Herrman, 1107 Bryant Bldg., Kansas City.
Place: Kansas City General Hospital. Time: On call.

Los Angeles County Medical Association, Pediatric Section

President: Dr. Alonzo Cass, 1908 Wilshire Blvd., Los Angeles.
Secretary-Treasurer: Dr. Gladys Patric Shahovitch, 3936 Roderick Rd., Los Angeles.
Place: Los Angeles County Medical Headquarters, 1925 Wilshire Blvd. Time: Second Monday of February, April, June, October and December.

Medical Society of the County of Kings and the Academy of Medicine of Brooklyn, Pediatric Section

President: Dr. Sydney Nussbaum, 247 Ocean View Ave., Brooklyn.
Secretary: Dr. Harry Bikoff, 850 St. Marks Ave., Brooklyn.
Place: 1313 Bedford Ave., Brooklyn. Time: 9:00 p. m., second Monday of each month, October to March, inclusive.

Medical Society of the County of Queens, Inc., Section on Pediatrics

Chairman: Dr. A. A. Trivilino, 88-07–150th St., Jamaica, N. Y.
Secretary-Treasurer: Dr. Edith A. Mittell, 144–38th Ave., Flushing, N. Y.
Place: Queens County Medical Bldg., Forest Hills, N. Y. Time: Third Monday of October, January, March and May.

Medical Society of the District of Columbia, Section on Pediatrics

President: Dr. Harry A. Ong, 1801 I St. N. W., Washington, D. C.
Secretary-Treasurer: Dr. William F. Burdick, 5402 Connecticut Ave. N. W., Washington, D. C.
Place: Medical Society Bldg., 1718 M St. N. W. Time: 8 p. m., fourth Thursday of every month.

Memphis Pediatric Society

President: Dr. E. C. Mitchell, 1073 Madison Ave., Memphis, Tenn.
Secretary-Treasurer: Dr. Harry Jacobson, 1193 Madison Ave., Memphis, Tenn.
Place: John Gaston Hospital. Time: Quarterly.

Milwaukee Pediatric Society

President: Dr. R. P. Schowalter, 411 E. Mason St., Milwaukee.
Secretary-Treasurer: Dr. George H. Wegmann, 2650 W. Hopkins St., Milwaukee.
Place: Children's Hospital. Time: Second Wednesday of each alternate month, beginning with February.

New York Academy of Medicine, Section of Pediatrics

Chairman: Dr. Leslie O. Ashton, 850 Park Ave., New York.
Secretary: Dr. Alfred Langmann, 108 E. 68th St., New York.
Place: New York Academy of Medicine, 2 E. 103d St. Time: Second Thursday of each month from October to May, inclusive, 8:30 p. m.

Northern California Affiliates

President: Dr. Crawford Bost, 490 Post St., San Francisco.
Secretary: Dr. William A. Reilly, 384 Post St., San Francisco.
Time: Second Thursday of September, November, January, March and May.

Northwestern Pediatric Society

President: Dr. Harold Flanagan, 711 Lowry Medical Arts Bldg., St. Paul, Minn.
Secretary-Treasurer: Dr. Everett C. Perlman, 620 Medical Arts Bldg., Minneapolis.
Place: Minneapolis, St. Paul, Duluth and Rochester. Time: January, April, July and October.

Oklahoma City Pediatric Society

President: Dr. J. Byron Snow, 1200 N. Walker St., Oklahoma City.
Secretary: Dr. G. R. Felts, 1200 N. Walker St., Oklahoma City.
Place: Oklahoma Club. Time: Fourth Friday of each alternate month.

Philadelphia Pediatric Society

President: Dr. Pascal F. Lucchesi, 4000 N. Front St., Philadelphia.
Secretary: Dr. Aims C. McGuinness, Children's Hospital, 1740 Bainbridge St., Philadelphia.
Place: College of Physicians, 19 S. 22d St. Time: Second Tuesday of each month from October to April, inclusive.

Pittsburgh Pediatric Society

President: Dr. E. L. Piper, 3200–5th Ave., Pittsburgh.
Secretary-Treasurer: Dr. Carl Ruder, 646 Washington Rd., Mount Lebanon, Pittsburgh.
Place: Pittsburgh Academy of Medicine. Time: Second Friday, alternate month from October to June, inclusive.

Richmond Pediatric Society

President: Dr. Louise Fry Galvin, 214 S. Boulevard, Richmond, Va.
Secretary-Treasurer: Dr. Herman W. Farber, 501 E. Franklin St., Richmond, Va.
Place: Richmond Academy of Medicine, 1200 E. Clay St. Time: 8 p. m., third Thursday of each month, except June, July and August.

Rochester Pediatric Society

President: Dr. David Wolin, 16 N. Goodman St., Rochester, N. Y.
Secretary: Dr. W. L. Bradford, 16 N. Goodman St., Rochester, N. Y.
Place: Rochester Academy of Medicine or arrangement by program committee. Time: Third Friday of each month from October to May.

St. Louis Pediatric Society

President: Dr. Max Deutch, 634 N. Grand Blvd., St. Louis.
Secretary-Treasurer: Dr. Peter G. Danis, 634 N. Grand Blvd., St. Louis.
Place: St. Louis Medical Society Bldg. Time: First Friday of each month from October to June.

Seattle Pediatric Society

President: Dr. Jay I. Durand, 1305–4th Ave., Seattle.
Secretary: Dr. Frederick B. Joy, 1215–4th Ave., Seattle.
Place: College Club. Time: Third Friday of each month, 6:30 p. m.

Southwestern Pediatric Society

President: Dr. Norman Nixon, 1136 W. 6th St., Los Angeles.
Secretary: Dr. Donald C. Shelby, 3780 Wilshire Blvd., Los Angeles.
Place: Jonathan Club of Los Angeles. Time: First Wednesday in January, March, May, September and November.

University of Michigan Pediatric and Infectious Disease Society

President: Dr. Campbell Harvey, 35 W. Huron St., Pontiac, Mich.
Secretary: Dr. Harry A. Towsley, University of Michigan, Department of Pediatrics and Communicable Diseases, Ann Arbor, Mich.
Time: Autumn, 1941.

Westchester County Medical Society, Pediatric Section (New York)

President: Dr. John B. Ahouse, 27 Ludlow St., Yonkers, N. Y.
Secretary-Treasurer: Dr. Elvira Ostlund, 64 Highland Rd., Rye.
Place: Grasslands Hospital, Valhalla, N. Y. Time: Third Thursday in October, December, February and April.